

OCT 1 1932

Vol. 29, No. 8

PSYCHOLOGICAL REVIEW PUBLICATIONS

October, 1932

# Psychological Bulletin

EDITED BY

EDWARD S. ROBINSON, YALE UNIVERSITY

HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)SAMUEL W. FERNBERGER, UNIV. OF PENNSYLVANIA (*J. Exper. Psychol.*)WALTER S. HUNTER, CLARK UNIVERSITY (*Index*)HERBERT S. LANGFELD, PRINCETON UNIV. (*Monographs*)

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PUBLISHED MONTHLY (EXCEPT AUGUST AND SEPTEMBER)

FOR THE AMERICAN PSYCHOLOGICAL ASSOCIATION

BY THE PSYCHOLOGICAL REVIEW COMPANY  
PRINCETON, N. J.

Entered as second-class matter at the post-office at Princeton, N. J., with an additional entry at Albany, N. Y.

# Publications of the American Psychological Association

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HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)  
S. W. FERNBERGER, UNIVERSITY OF PENNSYLVANIA (*J. Exper. Psychol.*)  
WALTER S. HUNTER, CLARK UNIVERSITY (*Index and Abstracts*)  
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containing original contributions only, appears bi-monthly, January, March, May, July, September, and November, the six numbers comprising a volume of about 540 pages.

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Review and J. Exper.: \$11.00 (Foreign, \$11.50).  
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Review, Bulletin, and J. Exper.: \$16.00 (Foreign, \$16.75).  
Review, Bulletin, J. Exper., and Index: \$19.00 (Foreign, \$19.75).

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**PRINCETON, N. J.**

# THE PSYCHOLOGICAL BULLETIN

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PROCEEDINGS OF THE WESTERN PSYCHOLOGICAL  
ASSOCIATION, STANFORD UNIVERSITY,  
CALIFORNIA, JUNE, 1932

ROBERT H. SEASHORE, SECRETARY, UNIVERSITY OF OREGON

The 1932 meeting was held on the Stanford campus (June 17-18) and was attended by more than a hundred members and guests, including psychologists from all parts of the United States. The chairman of local arrangements was Paul R. Farnsworth. The officers for the ensuing year are: President, E. K. Strong, Jr., Stanford; Vice-President, H. E. Jones, University of California; Secretary-Treasurer, R. H. Seashore, University of Oregon.

The Association accepted the invitation of the University of Southern California to meet in Los Angeles in 1933, the date to be decided later.

## PROGRAM

*A Classification of Experimental Methods in Psychology.* By  
ROBERT H. SEASHORE, University of Oregon.

The proposed classification is divided roughly into four groups of methods: (1) Psychophysical methods, (2) Introspective methods, (3) Motor and verbal-motor, and (4) Developmental methods. When these are arranged in order of complexity of variables to be described, there is found a practically continuous variation from one end to the other. The principal names and synonyms as found in the older manuals and more recent literature are given together with brief examples of each type of application. It is shown that all four types of methods are really but different aspects of the same fundamental experimental problem, namely, to describe "discrimination responses" of an organism. Suggested interpretations of the classification are given for various viewpoints in systematic psychology, favoring a logical eclecticism. A large table of the methods and their

derivations is available. Suggested uses include a greater emphasis upon the teaching of experimental methods as such in laboratory psychology as a basis for more critical reading and for research tools.

*Further Data on Speed of Serial Reaction as Between Musculatures.*

By MALCOLM CAMPBELL, Stanford University. (Introduced by Paul R. Farnsworth.)

From one hundred college men reactions were obtained from each of four musculatures, the two arms and the two legs, to a serial discrimination problem measuring speed in pursuit of a stimulus which changes position whenever reacted to. Using visual stimuli, data are obtained as a check on a previous report of high correlations between different musculatures on such a performance. Using auditory stimuli, additional data are obtained showing the significance of the sense organ employed for this type of performance.

*The Relative Influence of the Factors of Distance and Orientation on the Maze Behavior of White Rats.* By BLEDSOE, BLODGETT, and MCGARITY, University of California. (Introduced by E. C. Tolman.)

In order to isolate the factors of distance from those of orientation a circular maze of twelve concentric circles was used. The path in one-half of the circles was equal and in one-half was not. This enabled the animals to respond in some of the circles in a direction away from food without involving the traversal of a greater distance. They were also allowed to respond in some of the circles in the direction of the shorter distance.

Thirty rats were given thirty runs each in such a set-up. The choice of the direction toward food in the equal alleys exceeded what would be expected by chance by .18  $\sigma$ . The choice of the short over the long exceeded what would be expected by chance by 8.63  $\sigma$ .

*Studies in Directed Activity.* By CALVIN HALL, University of California. (Introduced by R. C. Tryon.)

A rat which had not been fed for twenty-four hours was placed in an enclosed circular field eight feet in diameter. Twenty grams of wet mash were located in the center of the field. The rat's movements were observed and recorded for two minutes. He was then removed from the field and after an hour was fed twenty grams of wet mash in an individual cage (or if he had eaten in the field, an additional amount which would give a total of twenty grams). One

two-minute run a day was given. If a rat was eating at the end of the two minutes, he was left in the field as long as he continued to eat. Fifty-two rats were run fourteen days under these conditions.

The term *directed activity* is used to describe the movements of a rat in this field. The activity is directed in the sense that it comes to be oriented toward the food in the center of the field, although in the initial trials it is confined largely to the outer walls. Moreover, the rat's behavior is selective in that it is directed toward an object, food, the eating of which is appropriate to the state of the organism, *i.e.*, those conditions which exist in an organism when it has not been fed for twenty-four hours. The fact that the rat does not immediately go to food and eat may be partially accounted for by considering (1) other directions which the activity takes such as (a) movements typical of an upset condition, measures of this condition being the amount of defecation and urination and the magnitude of the distance traversed, and (b) the tendency of rats to follow walls and shun open spaces, or by considering (2) the conditions which determine the magnitude of the direction toward food as measured by (a) weight and (b) amount of food eaten.

*Senior Opinions About University Instructors.* By HOWARD R. TAYLOR, University of Oregon.

Senior opinions of their college instructors have been studied critically from the standpoint of reliability and validity because of the frequency with which student opinion in such matters is reflected in administrative action. The unreliability of such opinions appeared in the fact that of the instructors cited about 50 per cent were considered by some seniors as among the three best they had ever had but by other seniors as among the three worst instructors they had encountered. The agreement between below average and above average students in regard to the merit of their instructors was closer ( $r=.67$ ) than that between the men and women ( $r=.35$ ), or that between majors and non-majors ( $r=.34$ ). University prestige, *i.e.*, academic rank correlated ( $r=.49$  in 1929 and  $r=.29$  in 1930) with the merit of instructors in the eyes of the students. The judgments of deans in regard to the merit of instructors had considerable in common with the opinions of the seniors ( $r=.66$ ), but the evidence suggests that it would be quite unreasonable to think of such opinions as reflecting in any useful way "traits" of the instructors themselves. Hence the proposal to use such opinions in the "self-improvement of teaching" is considered questionable.

*Improving the Validity of Personality-Ratings.* By HERBERT S. CONRAD, University of California.

Thirty children were rated by teachers at the Institute of Child Welfare on the 231 traits of the California Behavior Inventory for Nursery School Children. As measured by the agreement between teachers, trait-composites were judged with considerably greater validity than individual traits. The average correlation between two teams of three judges, for the trait-composites, is close to .90. The use of trait-composites instead of individual traits in the measurement of character, is comparable to the use of subtests instead of individual items in the measurement of intelligence.

*A Study of the Alleged Peculiarities of the Only Child.* By ALBERT CAMPBELL, University of Oregon. (Introduced by E. S. Conklin.)

According to popular belief and the articles of numerous authors "only" children differ definitely in certain characteristics from children raised with sibs. This difference has been cited by many as being apparent not only in various personality traits but even in mental and physical endowment and development. This study is an effort to discover if these peculiarities, theoretically postulated, may be experimentally demonstrated.

Fifty women only children and fifty men only children, all college students, were selected. Data was obtained concerning their personality traits, intelligence test score, grade averages (high school and college), and physical rating. The same data were obtained from 100 students who had been raised as neither only, first, or last children. This control group was paired with the experimental group on the basis of intelligence rank, high school record, and class in college. None of the 200 subjects was living at home at the time the data were obtained.

The data thus obtained have been compared to learn if there are any differences appearing between the two groups. Indications are that though the male subjects show no differences worthy of note in any of the data, there are apparent certain differences among the women subjects which would seem to suggest that the only child situation has a more pronounced and lasting effect on the female child than on the male.

*The Judgment of the "Balance" of Pictures.* By ROY CLINTON LANGFORD, Stanford University. (Introduced by Paul R. Farnsworth.)

Fifty-one pictures, most of them landscapes, were judged for "balance" by forty men untrained in pictorial art. Typewritten instructions explaining the meaning of the term "balance" were given to each subject. The rating scale was composed of five steps—from "considerably overbalanced to the left" through "balanced" to "considerably overbalanced to the right." Three groups of pictures showing the most consistent judgments of "balanced," "overbalanced to the left," and "overbalanced to the right" were found

to contain three pictures each. The  $\frac{D}{\sigma D}$  of the means of the judgments of these different groups is  $7.00 \pm$ .

*Sex Difference in Learning Abilities of Albino Rats.* By MICHAEL I. TOMILIN, Stanford University. (Introduced by C. P. Stone.)

The experiment was undertaken to determine the amount of sex difference, if any, in the learning abilities of albino rats.

Sixty-eight pairs of albino rats were used. Each male-female pair was made up of litter-mates. The animals were started on the experiment at the age of  $100 \pm 3$  days. The following instruments were used: preliminary alley straightaway, 20 trials; modified Warden U maze, 40 trials; reversed U maze, 20 trials; Stone multiple light discrimination box, 30 trials; reversed such, 50 trials; preliminary elevated straightaway, 6 trials; elevated T maze, 16 trials; reversed T maze, 10 trials. The progress of learning was measured by three criteria; trials required to master a situation, errors committed, and time consumed. The obtained data were analyzed with respect to central tendency and variability of performance. In comparing the means and standard deviations the critical ratio technique was used and the formula for standard error of the difference was used in full, sib-correlation being computed for the correlational term of the formula.

The analysis of the data revealed that there is no evidence of sex difference either in learning abilities or in variability in the performances of albino rats.

*Can Cats Hear Tones?* By M. HERINGTON, JR., and RALPH H. GUNDLACH, University of Washington.

It has generally been held, since the work on hearing by Johnson with dogs, and Hunter with rats, that the simpler mammals cannot

learn to make gross overt responses to tones. Pavlov's students, however, profess to have demonstrated fine auditory discrimination with dogs, using the conditioned reflex methods, and Upton has demonstrated both conditioned reflexes and gross overt responses of guinea pigs to practically pure tones. Quite recently Wever and Bray have published a number of studies on the characteristics of the auditory nerve response which indicate that the cat's cerebrum should have all the sensory-neural conditions necessary for tonal perceptions.

Our efforts have been directed toward training cats to make auditory discriminations. So far we have failed. The conditions have been successively simplified, however, from a choice between two tones to a choice between one tone and silence (localization is still involved). We propose next to offer the alternatives of a raucous buzzer and silence, requiring localization of the buzzer; and finally, going L when a tone is sounded and R when there is no tone. If our equipment permits we shall gradually increase the complexity of the sound until discrimination occurs and make an analysis of this complexity.

*The Visual Acuity of Homing Pigeons.* By RALPH H. GUNDLACH, University of Washington.

This study follows a demonstration that homing pigeons have no absolute sense of direction, and a field study illustrating the importance to successful homing of training and weather conditions favoring good visibility.

The discrimination cards are photostatic duplicates and enlargements of 8 in. x 8 in. printed sheets of fine lines and equal spaces. The birds are taught to go to the horizontal lines and to avoid the vertical lines. The width of the lines and spaces is reduced till discrimination fails. The cards are exposed at the ends of a V shaped box, 16 ft. from the starting point. The length of the alleys assures distance accommodation and a small enough angle of vision.

Training is arduous. Even on the grossest patterns the pigeons tend to set up position habits or "continuation after success, alternation after failure" habits. It seems here impossible to satisfy requirements such as 20 consecutive perfect runs. Discrimination is consequently not in terms of the per cent right, but in terms of the significance of the difference between the curves for right and wrong choices that plot the frequency of various successions of runs right (or wrong). If this criterion of learning is valid, it now appears, although the problem is incomplete, that pigeons have greater acuity under these conditions than have humans.

*A Method for Studying Intonation in Children's Speech During Free Activity.* By HOWARD WELLS, University of California. (Introduced by M. C. Jones.)

For the study of intonation as a factor in the development of socialized speech, a method was required for registering pitch changes and stress in the recorded vocalizations. A preliminary study with a dictaphone indicated the difficulty of using apparatus methods in connection with this problem. A technique was developed for marking diary records of children's speech during free activity with tonetic symbols to indicate inflection and accent. A study of the agreement of two observers, making simultaneous records, indicates that a satisfactory degree of objectivity can be obtained.

*A Concealed Intelligence Test for Adults.* By LELAND G. STOCKDALE, University of California. (Introduced by H. E. Jones.)

A reaction sheet was constructed consisting of three types of test material, (1) multiple choice items involving verbal understanding and common sense judgment, (2) a vocabulary test composed of forty words from eight CAVD levels, (3) information, composed of sixty-five words selected from sources within the common reading range of adults. The interest value and the acceptability of the test for adults were considered in preparing the content for each item, and also in the form of presentation; the information and vocabulary tests were given by a free association method. Reliability and validity were computed for a group of 192 elementary psychology students. Inter-correlations are presented for the three sub-tests, and also correlations with grades and with the Army Alpha. The conclusion is drawn that the test, although in concealed form, possesses a sufficient community of function with other standard intelligence tests, to be applicable for the measurement of adults.

*The Speech Contacts of the Pre-school Child.* By SIDNEY ADAMS, University of California.

A study of the conversations and other types of socialized speech in a nursery school group. The relation was investigated between the age of the children studied and the age and status of the persons they addressed. The length and character of conversations was studied at different age levels between two and four years. Dependence on adults, in so far as it is shown by speech contacts, was also determined for these different age-levels.

*The Relationship of Overt and "Implicit" Emotional Responses.*

By H. E. JONES, University of California.

The material used consists of (a) galvanometric records for 80 children, tested twice, with a standardized stimulation schedule; (b) ratings, by two observers, of overt responses to each stimulus; (c) ratings, by three teachers, of emotional traits in free play situations; (d) systematic observations of emotional expression in free play situations. Reliable measures can be obtained of both overt and implicit emotional responses, but the correlation between these tends to be low and negative. According to the nature of the stimulus, however, and also according to the reaction type of the subject, the relationship may become markedly negative or may shift to a moderate positive value. Conclusions are suggested regarding the characteristics of emotional patterns.

*A Study of Locomotion in Infants.* By NANCY BAYLEY, University of California.

Moving picture records have been made of early locomotion in a group of 57 infants who were brought to the Institute of Child Welfare at monthly intervals for observation. There seems to be some slight relation between the age of first creeping and the form it takes.

The varied forms of crawling, creeping, first steps, etc., are illustrated with moving pictures.

*A Study of Twins with Special Reference to Heredity as a Factor in the Determination of Differences in Environment.* By PAUL T. WILSON, University of California. (Introduced by H. E. Jones.)

Previous investigations of twins have centered attention upon the relation of differences in heredity to the structural and functional characteristics of the individual. The present study concerns the influence of heredity upon certain phases of the individual's environment.

For this purpose a group of identical twins of high school age was compared with a similar group of fraternal twins. The total sample consisted of 194 pairs. The points of comparison included a large number of items relating to their every-day surroundings. The data were obtained by a combination of the interview and the questionnaire techniques, and concerned such differences in the environment as: attending different schools and classes; the length, frequency and causes of separations from each other; differences in social relations at home and among friends; differences in foods liked and in types of activities preferred. Data from matched pairs of unrelated individuals were used as a control for part of these observations.

The data indicate that compared with single-born individuals, the environmental conditions surrounding a pair of twins of any type are usually very similar for both members; however, the findings demonstrate that in most of the phases studied these conditions, on the average, differ more for fraternal than for identical pairs.

The conclusion is that the greater similarity in the environments of the identical twins can be attributed to the influence of their identical heredity which led, or forced them to select environments which were more similar.

*Interest Maturity.* By EDWARD K. STRONG, JR., Stanford University.

From a comparison of the interests of fifty-five year old men in many occupations and of fifteen year old boys a scale has been devised for measuring interest maturity. The reliability of this scale is high. The results so far obtained indicate that interest maturity increases very rapidly from fifteen to twenty years of age and thence on to thirty more and more slowly so that there is relatively little change from twenty-five to fifty-five years of age. The great variation in interest maturity at any age makes it appear doubtful if interest maturity can be expressed in terms of age as intelligence tests are handled.

*The Nature and Aims of the Introductory Course in Psychology.*

By A. R. GILLILAND, Northwestern University (by invitation).

This is the first of three studies of the introductory course in psychology that is being conducted by a committee of the Midwestern and Southern Psychological Associations. This study is concerned with the nature and aims of the course. The later studies are to consider the content and methods of the course. The results here presented were collected from instructors in more than a hundred colleges and universities from the Middle West, South, and East.

More than half of the introductory courses are three semester hours in length. This holds for both large and small institutions and for all sections of the country. The next most common length is three year hours. A few courses are two semester hours and a few others as much as five year hours. There is some laboratory work in connection with some of the year courses. More often it is demonstration. A large majority of institutions have little or no laboratory work of any kind in connection with the introductory course.

The aims as stated by the large institutions were (1) to satisfy the student's desire to acquire a knowledge about psychology in general, and (2) to train students in the scientific method. More than half of the votes were for these two out of a list of seven. The

smaller institutions selected the same aims in the reverse order for the first two but gave almost equal importance to (3) to train students to use psychological knowledge for personal adjustments, and (4) to teach the facts and principles of psychology so that the student may apply them. The Southern larger institutions checked aims more nearly like the Northern smaller institutions while the smaller Eastern institutions checked somewhat similar aims to larger institutions.

*The Nature of a Psychological Explanation.* By E. R. GUTHRIE, University of Washington. (Address of retiring Vice-President.)

The task of natural science is the prediction of natural events. This prediction is achieved by generalizations or laws based on past observation and verified by application to new instances. A psychological fact is explained when it is shown to be an instance of such a generalization.

Such laws are of general form: *In a general situation of type S, the probability of event C is  $x$  if event A has occurred.* C is the event whose occurrence or non-occurrence interests us, and A is the sign which enables us to predict C.

Psychological writers are divided into schools according to the types of events they are interested in predicting, and according to the type of events they choose to use as the indicators of the predicted events.

"Mechanistic," "purposivistic" and "gestalt" explanations are valid to the extent that they make prediction possible. The characteristics of a "good" explanation are that the event predicted shall be clearly indicated and readily observed and that the same shall be true of the event used as a sign. The predicted event may be a response in the sense of muscular contraction or glandular secretion, or it may be a goal defined without reference to the means by which it is attained.

A number of types of psychological explanation fail to meet these requirements. Other types which are at first sight incompatible prove to be valid and without mutual contradiction.

*Cerebral Control in the Maze Learning of Rats.* By C. H. HONZIK, University of California. (Introduced by E. C. Tolman.)

Two groups of rats (21 in all) were trained on an elevated 19-blind T-maze, with constant interchanging of the units of the maze on succeeding trials. The rats were thus required to learn the maze independently of specific sensory cues from within the maze. Rotation of the maze within the room showed that there were no directive cues from without the maze. When the rats had learned the maze

they were given "short cut" runs, that is, by the insertion of new short paths and blocks within the maze the rats were forced to cut out parts of the maze and to jump, figuratively speaking, from an early to a later part of the maze. The performance of the rats in the later part of the maze, immediately following the "short cut" path, showed no significant increase in errors. It was concluded that the concept of stimulus response bonds is quite inadequate to explain maze learning, and further, that kinaesthesia is not a *necessary* factor in the maze habit. In general Lashley's argument that "the maze habit cannot be interpreted as a series of kinaesthetic-motor reflexes but must be referred to some intraneural mechanism capable of producing an integrated sequence of movements in the absence of directive sensory cues," is strongly supported.

*Choice-Point "Expectancy" in the Linear Maze.* By JACK BUEL, University of California. (Introduced by E. C. Tolman.)

Two groups of rats were run in an eight T-unit linear maze, one run per day for two hundred and eleven days. The true-path pattern was simple alternation. Each group ran a mirrored pattern of the other. Early in the learning the groups became "fixated" on those blinds and true-paths which were in the same direction as the correct choice in the last unit. On the 20th trial the last unit was removed, thus making the last correct choice of the resulting seven unit maze opposite to that of the eight unit maze. Within a few trials "fixation" of blinds and true paths in opposition to that obtained in the eight unit maze occurred.

The conclusions are (1) that since each unit is identical in general structure with every other unit of the linear maze, each choice at the bifurcation of paths during the early stages of learning is based upon an immediate expectation of reward, *i.e.*, identified with the last unit, and (2) that only in the later stages of learning does the possible entry of general orientation factors and specific cues break down this expectancy factor and non-differentiation of units.

A further analysis explains, in part, Warden's results on the order of elimination in the linear maze, and refutes his statement that such factors as were found here were not included in the results obtained in his maze.

*Position Versus Color in Simple Choices by Young Chimpanzees.*

By JOSEPH G. YOSHIOKA, Anthropoid Experiment Station of Yale University.

Four young chimpanzees of three to five years of age were given a series of two alternative choices. When two black cans containing

food were presented for choice, three animals preferred to choose the right-hand side can first, the fourth the left-hand side can. This side preference was correlated with handedness of the animals previously tested. The habit was made to disappear by making the preferred can a non-reward one. Next, black and white cans were presented for choice, and it was found that the side preference appeared as before, although to a lesser degree, but no color preference was shown. After breaking this habit as before, only the black or white can irrespective of position was rewarded. Under this condition black was preferred to white. Next, in delayed reaction situations position was more correctly chosen than color. Next, the "opposite" test in delayed reaction situations was given. The order of the cans while out of the animal's view was reversed. Now the correct can was on the "opposite" side to that when food was placed in it. This habit was established with great difficulty, and only when positional cues were supplemented by color cues.

Therefore it may be said that in two alternative choice situations positional cues were utilized more than color cues by chimpanzees; that side preference was primarily determined by a dominant hand; that black was preferred to white.

*The Growth of Adaptive Behavior in Infants.* By HELEN M. RICHARDSON, State College of Washington.

Techniques similar to those described in Köhler's *The Mentality of Apes* and in Gesell's normative studies of infants were employed in a developmental study of adaptive behavior in infants from the age of twenty-eight weeks to a year. An account of the growth of behavior in string problems is to appear in *Genetic Psychology Monographs* for September-October, 1932. Another experimental situation permitted the securing of a toy by reaching through a grill and rotating an 18-inch horizontal lever, the pivot of which was 5 inches from the near end. Fifteen infants were individually observed at intervals of four weeks in a total of 79 examinations under controlled conditions.

A sharp increase in ability to solve the lever problems appeared between the ages of 40 and 44 weeks. Successes seemed to be due to maturation, motivation, trial, and sometimes insight. Erroneous words were frequently due to responding to the visual rather than to the physical features of the situation, *i.e.*, tugging directly at the near end of the lever. This might be termed a false inference. Demonstration by the examiner added nothing to the very few successes

that preceded 44 weeks, and was responsible for less than one-fourth of those that occurred at 44, 48, and 52 weeks. Success at one examination was occasionally followed by failure four weeks later. Such relapses usually seemed to have an emotional basis. Individual differences in reaction to thwarting were apparent.

*Gains Made in Tool Subjects by Normal School Students During a Two-Year Course.* By HARRY V. MASTERS and C. C. UPSHALL, Washington State Normal School.

Entrance tests in English usage, arithmetic reasoning, arithmetic computation, history, geography were given to 125 freshmen in September, 1928. The same tests were given in May, 1930, just before they were graduated from the two-year curriculum. The study answers the following questions:

1. What gain in score on the entrance tests has been made by the graduating class during their six quarters of attendance in the Bellingham Normal School?
2. How significant statistically are these gains?
3. What changes are revealed, at the completion of six quarters' work, in the variability of the scores on each of the tests administered?
4. In which fields do students require the greatest number of retests to meet the standards set up for enrolment in practice teaching?
5. What are the factors contributing to the gains made during the two year Normal course?

*Individual Differences in the Final Learned Act.* By ROBERT C. TRYON, University of California.

The experiments reported bear on the questions: After rats have plateaued in learning a maze, are animals of different degrees of final efficiency guided by fixed stimuli, multiple- or single-moded? Are individual differences determined by differences in the excellence of the organs which sense the stimuli? The method employed was to permit rats to reach limits of learning in a 17-unit T maze, then in a following "test run" to remove, or to disorder singly or in combination stimuli of different sense modes. In the test run of Experiment I, 71 rats experienced partial visual, tactual and olfactory disruption by an interchange of "choice-points," and curtains in the maze. In Experiment II, 71 rats experienced in the test complete loss of vision by running them in darkness. In the test of Experiment III, by a removal of a section of the maze and thus "short-

cutting" them, 76 rats experienced kinesthetic disruption. In Experiments IVa and IVb, 142 rats experienced visual, auditory, olfactory, tactual, and kinesthetic disruption on the same test by running them in darkness, with the maze covered with a blanket (to disorient wall-reflected auditory cues), with all the maze units interchanged (the *pattern* of course kept constant) and with a "short-cut" as in Experiment III. The results show that relative to the amount the animals *had* learned by the test run, the loss of efficiency by such sensory changes on the test run was not great, and to the extent to which it occurred, it was largely attributable to "emotional up-set." Furthermore, the correlation between the test run and the preceding fixed stimuli run was of the order .70-.95, and of similar magnitude to that between two fixed stimuli runs. The conclusion is drawn that in the final learned act, the rats are *not* guided by multiple- or single-moded fixed stimuli, or by serial kinesthetic redintegrations, and that individual differences are not determined by differences in sensory capacity. The hypothesis is offered that the animals are guided by abstracted or generalized sets.

*The Similarity of Twins in Occupational Interests.* By HAROLD D. CARTER, Stanford University.

The Strong Vocational Interest Blank was given to 108 pairs of twins, including 43 monozygotic pairs, 31 like-sex fraternal pairs, and 34 pairs of unlike sex. The twins were classified using the techniques outlined by Siemens, Muller, Newman, Dahlberg, and others. In the preliminary study, definite preferences of females for certain types of occupational interest showed clearly the need for an analysis which would allow for sex differences, hence in this study correlations of scores were calculated separately for the two sexes. The coefficients of family resemblance tend to be considerably higher for some of the scales than for others, and the resemblances are definitely greater for monozygotic than for dizygotic twins. For the identical twins the average of the correlations for the 23 separate interest scales is approximately .50, while for dizygotic twins it is approximately .30. The resemblances of like-sex fraternal twins are on the average just slightly greater than those for unlike-sex twins. The data constitute a first step in analysis of the origins of occupational interests, and have an important bearing on twin resemblances in general because of the relation of these interests to experiences. Conclusions are only tentative since the need for a much larger body of data is apparent.

*A Study of the Kwalwasser Test of Music Information and Appreciation and the Construction for this Field of a More Reliable and Advanced Test.* By MINCHI YOUNG, Stanford University. (Introduced by Paul R. Farnsworth.)

The term "general musical knowledge" seems to include (a) information concerning the field of music, (b) the use and application of the language of music, and (c) the execution and interpretation of musical compositions. The Kwalwasser Test (first publication 1926, second publication 1927) measured the first phase. Reliability figures as found on two groups of musical students (San Jose Teachers' College and the Eastman School of Music) were .92 PEr .014 (SD, 32.30) and .84 PEr .032 (SD, 25.59) respectively. A newly constructed test, the Young Test of General Musical Knowledge, attempts to measure the first and second phases. Its reliability on the same Eastman School of Music group was found to be .97 PEr .006 (SD, 53.98). In the case of the Young Test, weightings do not affect the final interpretations significantly. The correlation of the Young with the Kwalwasser was found to be .85, PEr .03.

The San Jose group resembled approximately the distribution of the Kwalwasser norms. The 0 percentile of the Eastman distribution was the equivalent of the 60th percentile of the Kwalwasser norms. In the case of the San Jose group, the correlation between the scores and the number of years of musical study was found to be .56 PEr .06. In the Eastman group, there was practically no relationship between the scores made on the Young or the Kwalwasser tests and the number of years of musical study, the number of phonograph records at home, or the amount of money spent monthly for musical purposes.

*Further Prestige Effects.* By PAUL R. FARNSWORTH and MITCHELL SAADI, Stanford University.

The purpose of this experiment was to study the degree of acceptance of dogmatic statements when they were attributed to liked or disliked people. Each statement was presented to three large groups of subjects who rated their acceptance of it on a five point scale. One group read the statement with the understanding that a certain well liked person had made it. In the case of the second group the statement was attributed to a certain disliked person. For the third group the statement was attributed to no one.

The attributing of the statements to well liked individuals gave the greatest augmentation of acceptance in most cases; when

attributed to no one the acceptance was next highest. Still, in a few instances the acceptance was least when the statements were attributed to no one. That is, the attributing of the statements to either well liked or disliked individuals augmented the acceptance. In a very few instances these rules did not follow. However, it would appear that these exceptions can be logically explained.

*Substitute Value and Substitute Activity.* By KURT LEWIN, University of Berlin.

If one interrupts an activity and substitutes another activity one can determine the substitute value of the second activity. Observing the changing frequency of resuming the primary activity one can say that the greater the decline in frequency, the higher the substitute value.

Lissner found that the substitute value of difficult activities is higher than of easy activities. Generally the degree of substitute value corresponds to the degree of reality (Mahler). But what degree of reality an activity has is determined not by the activity itself but by the relationship between the original and the substitute activity. The substitute value further depends upon the state of needs and the degree of seriousness of the whole situation. From the dynamical point of view there are close connections between substitute activity and use of tools.

It is characteristic for feeble-minded children that the substitute value under some conditions tends to be extremely low and under other conditions extremely high.

*A Technique for the Study of Relative Food Preferences of the White Rat.* By PAUL THOMAS YOUNG, University of Illinois (by invitation).

A film shows the technique employed in studying food preferences of the white rat. Experiments have shown that when the diet is kept constant rats are relatively uniform in their cravings and aversions for food. Foods arrange themselves in a genuine series from high to low preference. This preferential series is relatively stable for given metabolic conditions. Gradual changes, however, in the craving for a particular food are observed over a period of time. Reversals of relative preference between two foods are also observed. The conditions which determine these mutations of like-dislike are being sought experimentally. Our technique can be used in a wide field of investigations dealing with specific appetites and aversions for

foods and the conditions regulating these specific cravings and aversions. The work promises to throw light upon the mechanisms of differential appetite as distinct from those of gastric hunger.

*Demonstrations of Experiments in General Psychology: 1. The Use of Motion Pictures.* By HARRISON MUSGRAVE, JR., and MILTON METFESSEL, University of Southern California.

Snatches of six motion picture films were exhibited, together with the recording blanks used by students. The plan is to keep the student actively participating, rather than passively watching, thus aiding his comprehension of the picture. The first film is entitled "Reflexes in the Frog," showing the responses of four frogs, with varying degrees of brain tissue removed, to a number of different stimuli. The film, "Determiners of Attention," illustrates five of the attracting factors in attention: magnitude, quality (color), movement, repetition, and intensity (brightness). The third, "Effect of Meaning on the Scope of Attention," utilizes the motion picture machine as a tachistoscope, with ten alphabetical letters photographed on one frame. Successively, the ten letters make (1) a single word, (2) unrelated words, (3) nonsense syllables, and (4) consonants. A fourth, "Reliability of Memory," consists of a few action scenes loaned from the RKO Studios, about which 45 questions are asked. A fifth is entitled "Measurement of the Müller-Lyer Illusion," and the sixth "Types of Apparent Movement." In the latter, time and distance are varied in and out of the limits for the perception of motion; movement is seen in the third dimension; and Wertheimer's effect of attitude on the Phi-phenomenon is shown.

*Demonstration of Experiments in General Psychology: X. Simplified Apparatus and Procedure.* By NEIL D. WARREN and MILTON METFESSEL, University of Southern California.

Along with the use of the motion picture projector, the phonograph and balopticon have previously been shown to be good laboratory instruments. Two standard phonograph records have been made for the demonstrations of auditory phenomena. The first record demonstrates (1) properties of the auditory stimulus and the difference between tone and noise, (2) sound interferences (beats and difference tones), (3) overtone analysis, (4) sonance, and (5) sounds of action currents. The second record demonstrates memory for spoken words.

Slides and flat projection material have been developed for

(1) after images, in which the students fixate the center of the screen, and keep a fixed gaze after the balopticon light is switched off, (2) color-mixture, projected on the screen, (3) simultaneous and successive contrast, (4) color-preference, (5) memory for names and faces, and (6) recall and recognition.

Simplified apparatus recently developed includes a reaction time apparatus which can be projected on the screen with a balopticon; mirrors easily attached to each student's seat arm and a piece of cardboard slipped on a pencil and resting on the hand as a shield for the mirror tracing experiment; human mazes, with cardboard shields covering all but a small square, through which the student traces the maze with a pencil; color, movement, and form in the periphery of vision, by five fixation points and seven cards with colors, forms, and movement, which are manipulated at a fixed point by the experimenter for each fixation point.

*Tendency Toward Least Action Behavior in Monkeys.* By J. A. GINGERELLI, University of California.

The animals were placed in a situation from which they could escape to food by means of a number of different solutions. The animals showed a tendency to select these solutions which were "easier," i.e., those which involved less distance and time.

*The Effect of Maze Reversal on Subjects Reporting Different Methods of Learning and Retention.* By FRANK C. DAVIS, University of California at Los Angeles.

The subjects, college students and instructors, learned a high-relief, finger maze. The maze was then reversed, with the subjects so informed, and they were instructed to trace the maze in its reversed position. The object was to ascertain whether or not differences in manner of learning and of retaining a maze pattern of the sort utilized for this experiment are correlated with differences in rapidity of adjustment to the reversed-maze situation. Results for the learning of the maze in its original position were similar to those reported by Warden, Husband, and others. When the maze was reversed, dominantly "visual image" and dominantly "serial-verbal" subjects experienced little difficulty in learning the new pattern. The dominantly "motor" learners, on the other hand, found the tracing of the reversed maze to be curiously interfered with because of the persistence of the orientations which they had acquired in the learning of the maze in its original position.

*Twin Resemblances in Motor Abilities.* By QUINN MCNEMAR, Stanford University. (Introduced by L. M. Terman.)

The resemblances of 46 fraternal and 47 identical pairs of boy twins of junior high school age was determined for the following performances: Koerth pursuit rotor, steadiness, speed drill, spool packing, and card sorting. Both individuals of a pair worked under exactly the same experimental conditions, and a high degree of motivation was secured by stressing intrapair competition and self competition. The resulting coefficients of resemblances for fraternal twins ranged from .39 to .56 and for identicals from .71 to .95, with median coefficients of .44 and .83 respectively, allowance having been made for errors of measurement and differences in range of ability of the two groups.

PROCEEDINGS, THIRD SPRING MEETING, NEW YORK  
BRANCH, AMERICAN PSYCHOLOGICAL  
ASSOCIATION

PAUL S. ACHILLES, SECRETARY

One hundred sixteen members and sixty-five guests attended the Third Annual Spring Meeting of the New York Branch of the American Psychological Association held Saturday, April 9, 1932, at the University of Pennsylvania in Philadelphia.

At the business meeting it was voted to accept the invitation from Yale University to hold the 1933 Spring Meeting of the Association in New Haven at a date to be announced later. The following officers and committees were elected for 1932-33:

Program Committee: G. Murphy, Chairman, Columbia; L. Carmichael, Brown; P. D. Stout, New York University.

Honorary President: Raymond Dodge, Yale University.

To the Board of Directors for a term of three years: Clark L. Hull, Yale University; H. S. Oberly, Pennsylvania.

Membership Committee: R. H. Paynter, Chairman, Long Island; M. S. Murphy, Pennsylvania; W. Hulin, Princeton.

Nominating Committee: D. Fryer, Chairman, New York University; H. E. Starr, Rutgers University; H. Nissen, Yale University.

The scientific program of the meeting comprised thirty-two papers, two clinical demonstrations by Professors Lightner Witmer and Morris S. Viteles, of the University of Pennsylvania, and the presidential address by Professor Margaret Floy Washburn, of Vassar College, on "Ejective Consciousness as a Fundamental Concept of Social Psychology." This address will appear in the *Psychological Review*. Brief abstracts of the papers follow:

*A Preliminary Experiment in Gustatory Deficiency.* SAMUEL W. FERNBERGER, University of Pennsylvania.

It has been discovered that certain complex chemical compounds developed by the du Pont laboratories are tasteful to some and tasteless to other individuals. The present experiment deals with the taste reactions of phenylthiocarbamide which is extremely bitter to some observers and tasteless to others although this latter group are able

to taste other bitters. The reactions of over 1,000 observers indicate that approximately one-third find the substance tasteless. A sex difference is apparent—there are more women tasters than men. The large number indicating a taste-deficiency would seem to offer an admirable chance to study sensory deficiencies as compared with the difficulty of obtaining observers for experiments with color blindness, tonal islands and the like.

*Equal Weights and Psychophysical Judgments.* FRANCIS W. IRWIN and LEON ARONS, University of Pennsylvania.

Psychophysical judgments on objectively equal weights were obtained from 7 S's. "Heavier" judgments showed the least variability and "lighter" the most, with "equal" in between. No effects attributable to degree of sophistication of the S's, practice, or fatigue appeared. The effect of the immediately preceding judgment, however, seemed quite definite in many cases. Five S's, for example, showed a tendency away from repetition of judgments. A quantitative index of the time error was developed; this index was positive for the total for all S's, indicating overestimation of the second weight. The method is advanced as peculiarly well adapted to the study of factors involved in the psychophysical judgment, which may be obscured by the presence of stimulus differences.

*Co-variation in Absolute and Differential Sensory Thresholds.* S. M. NEWHALL, Yale University.

One phase of this problem requires comparison of RL and DL of a number of subjects to discover what relationship may exist between the magnitudes of their thresholds. A second phase necessitates experimentation with a given subject at various times or under various conditions to see what co-variation may occur between his RL and DL. Some results by Culler with thermal stimuli seem to indicate an inverse relation; Kenneth and Thouless, using auditory stimuli, secured results which point to a direct and continuous relation between the thresholds. The present study is visual and the data to date consist of measures of RL and several DL for white light intensity for each of 16 subjects. Thresholds of some subjects are taken repeatedly at about 9:30 A.M. and 4:30 P.M. A divided circular field of  $2.5^\circ$  visual angle is used throughout, and the method is a form of the method of limits with continuous change. Preliminary indications do not favor the hypothesis of direct, proportional variation, but technical sources of error are numerous.

*Brilliance as a Function of Apparent Distance.* WM. D. TURNER,  
Bryn Mawr College.

In a large adjustable stereoscope four equally illuminated gray fields on a black background were made to fuse in such a way that two gray fields were seen by the subject, one field and its background appearing to be farther away from the subject than the other. Under these conditions the more distant field was predominantly judged brighter. Thus, the Law of Inverse Squares does not hold for apparent brilliance when the illuminated fields are *perceived* as being at different distances and on backgrounds. When both gray fields were made to appear respectively about forty and eighty centimeters in front of their common background, the gray field nearer the subject tended to be seen as lighter. This latter effect of removal from the background in the third dimension is similar to more marked phenomena found earlier with a subject having unusual defects of perception of color and form.

*Audiometric Determinations in the Guinea Pig.* GEO. P. HORTON,  
Princeton University.

By employing a conditioned respiratory response, the lower intensity limits for audition in the guinea pig were studied. The animals were presented with a loud tone followed by an electric shock until they exhibited significant breathing changes to the tone. A modified method of limits was used to determine the absolute intensity threshold for the eight octave tones in the range of 64~ to 8192~. The animals were trained and tested within a sound-proof box. The tones were relatively pure ones produced by an audio-oscillator.

*Conditioned Eye Movements to Sound Based on Reflex Eye Movements to Rotation.* G. R. WENDT, Yale University.

The conditioned reflex hypothesis of the mechanism of learning is generally stated as being the substitution of stimuli through double stimulation. An extended analytical study of the character of conditioned eye movements based on reflex eye movements to rotation gives results which challenge this view. (a) Conditioned eye movements never duplicate the nystagmus of rotation. (b) New responses which were originally present to neither stimulus emerge as a result of double stimulation. (c) The course of modification is determined by the character of the whole stimulus situation rather than by its elements. The phenomena of modification of eye movements may conveniently (though artificially) be divided into three categories:

(1) anticipatory reactions made between onset of sound and onset of rotation, (2) regularization and systematization of response during rotation, (3) responses connected with cessation of rotation. For the description of the entire process the terminology of conditioning is very inadequate. In the absence of any true explanatory hypothesis, functional and dynamic descriptions appear most fruitful for understanding. The results indicate that the conditioned reflex hypothesis is framed from only a segment of the whole modification process, this segment being better described as "anticipatory reaction."

*The Difficulty of Conditioning the Achilles Reflex.* By C. R. GARVEY, Yale University.

The natural stimulus in these experiments was a blow of a falling pendulum on the Achilles tendon and the neutral stimulus a loud buzzer. Twelve college boys were used as subjects, some in a prone position and some sitting. The interval between the natural and neutral stimuli as well as the interval between reinforcements was varied. A large number of combined stimulations (500 or more with some subjects) was given, interspersed with test stimuli at irregular times. The results show very little evidence of ordinary conditioning, and we must conclude that unless more favorable conditions are devised, the Achilles reflex is not readily conditioned and therefore not suited to conventional conditioning experiments which demand large numbers of conditioned responses. This is also a critique of the conditioned reflex theory of learning which assumes double stimulation to be the sufficient condition for establishing substitution of stimuli. Even in case more favorable conditions are devised and the reflex conditioned, our results show that mere double stimulation is not sufficient.

*The Modifiability of Attention Control in Early Childhood.* HELEN THOMPSON, Yale University.

Observed periodically from the age of six weeks to three years, seven-months identical girl twins were found to display in both spontaneous activity and in test situations, slight but consistent differences with respect to persistence, perseveration, and range of activity. Using one twin as a control, an attempt was made to modify the behavior of the other twin by training in these traits. The training period lasted approximately three and one-half months with two periods a week, each an hour in length. The results, in spite of the limitations of the study, are highly suggestive concerning the modifiability of the traits in question and indicate fruitful fields for further research.

*Language Patterns of Preschool Children.* MARY SHATTUCK FISHER, Child Development Institute, New York.

Stenographic records of the language of 72 children (place, time and stimuli also recorded) were taken on three different mornings for each child in the same environment, by a controlled method, and by a qualified recorder.

The data were recorded so that kinds of sentences used appear to indicate stage and complexity of language. Sentences were also recorded to fall into three categories, to indicate degree of egocentricity and socialization of the child: Category I—Self as Subject; Category II—Other Person as Subject; Category III—Thing as Subject.

The data were analyzed in four groups: Construction Analysis by chronological age and sex; Functional Analysis by chronological age and sex; Social Indices by chronological age and sex; and Individual Differences.

Thus grammatical form is used to indicate the various stages through which children pass in gaining linguistic control. Differences between chronological and mental age levels are shown, as well as individual differences at any given level.

*Social Resistance of Preschool Children.* RUTH KENNEDY CAILLE, Child Development Institute, New York.

The subjects of the study are 36 children attending the nursery school of the Child Development Institute at Teachers College, Columbia University, during 1929–30 and 1931–32. Three types of records are being used: individual observation records during free play, stenographic records of individual intelligence tests, and stenographic records of all language responses made by each child during two days.

In making the observational records, a given child was followed for 24 five-minute periods. His resistant and acquiescent acts were recorded on a mimeographed blank. These records are being analyzed for resistance, acquiescence, and aggression. The stenographic records of the intelligence test and of each child's language are being analyzed for resistance.

The study provides a method for the observation and analysis of social resistance in a natural situation and in an intelligence test situation. Definite individual differences have been found among the children studied.

*The Development of Fine Prehension in Infancy.* B. M. CASTNER, Yale University.

This report is based upon a motion and frame-by-frame analysis of cinematic records of the responses of 59 infants to a white pellet, 7 mm. in diameter, placed upon a table-top in front of the seated infant under standardized conditions. The ages represented are 20, 28, 32, 36, 44, and 52 weeks. The responses were analyzed in terms of (1) *regard* for the object, (2) the hand *approach* to it, and (3) *closure* of the hand to secure it. Successful prehension, which is not found at 20 weeks, is practically perfected by 52 weeks; and the development of the response through the age-range studied shows certain relatively well-defined growth patterns in all three of the phases of prehension which were analyzed.

*Comparison of a Group of Working Children with a Similar Group Still in School.* BEATRICE CANDEE, Vocational Service for Juniors, New York City.

Comparison of 164 continuation school boys who were placed on jobs in September and October of 1930 and reinterviewed six months to one year later, with 130 boys, covering the same age range, referred for high school scholarships during the year September, 1930, through August, 1931.

The chief basis of selection of the two groups lies in the attitude of the child and family toward further schooling. Financial pressure is probably greater in the scholarship group, yet removal of the child from school is a last rather than a first resort. Relatively few employment children have left school unwillingly.

Scholarship children show a far higher percentage of foreign born parents. Financial need probably quite as great on an absolute basis and certainly much greater in relation to standards. They have a considerably higher percentage of broken homes and a larger percentage of working mothers. For the same intelligence levels, they show markedly greater acceleration in school and markedly less retardation. They have a greater variety of recreational interests. They are a much more alert and interesting group of children.

*Susceptibility to Retroaction at Various Grade Levels.* THELMA A. DREIS, Yale University.

In the present study, the susceptibility to *retroaction* with age as indicated by grade location was investigated. (The work of Stern and others has demonstrated the decrease of suggestibility with age.)

A substitution test which the writer used in a previous study with college students was simplified for this group of elementary school children (grades 2A to 8A). The results of 672 subjects were considered.

A preliminary analysis of the results indicates that: (1) There is a gradual increase of symbols completed from grade to grade in original learning, interpolation, and relearning; (2) Pro-active inhibition is almost negligible; (3) Per cent of saving is relatively constant, the range being from 11 to 18 per cent; (4) There is relatively the same degree of susceptibility to retroaction in all grades, and no apparent increase or decrease with age as indicated by grade location.

*The Use of the American Council Psychological Examination to Test High School Juniors.* MAZIE EARLE WAGNER, University of Buffalo.

High school juniors in six Buffalo high schools were tested with the American Council Psychological Examination and with the Otis Self Administering Test of Mental Ability, Higher Examination, Form A. Graphs comparing American Council Psychological Examination scores made by entering freshmen at the University of Buffalo and by high school juniors show that the two groups differ principally on the English tests (Completion and Opposites) and to a lesser extent on the Arithmetic Test. Tentative norms have been drawn up.

Correlations have been run between the American Council Examination scores (individual tests and total) and the Otis Self Administering Test of Mental Ability (thirty minute raw score, thirty minute Intelligence Quotient, twenty minute raw score, and twenty minute Intelligence Quotient), and also between these two tests and school grades made by these high school juniors.

Results would seem to indicate that the American Council Psychological Examination may well be used to test high school juniors and seniors, that it more efficiently predicts school grades at this level than does the Otis Self Administering Test. Its greater prediction value probably lies in the fact that it does not cramp in the upper levels of ability as do many of the tests used on the high school level.

*Routine and Initiative in Infancy and Young Childhood.* HELEN T. WOOLLEY, Christodora House, New York.

Educational theory, from ancient to modern times, has shifted emphasis back and forth from the need of training the young to conform to accepted standards of behaving, of thinking and of knowing on the one hand, and the need of encouraging initiative, independence

and originality in youth on the other hand. In dealing with infancy and young childhood stress has fallen on the phase of routine training and insistence upon obedience. No one questions the ultimate importance of originality and creativeness. The attempt of this paper is to show how these two phases manifest themselves in infancy and young childhood, and how educational treatment should take them both into account.

*An Evaluation of Some Prevalent Neural Conceptions.* M. N. CHAPPELL, New York.

On some critical points we have verified an observation made by Hughlings Jackson to the effect that the nervous system compensates for injury in an orderly fashion.

In the interpretation of data gathered from organisms whose nervous systems have been injured the biological sciences have, one and all, neglected this capacity for compensation and the mechanism underlying it. As a result the decerebrate neurophysiologists present us with quantities of interpretations which are quite without meaning to the organism under biological conditions; biologists account for the "inhibition" of tropisms; physiologists and neuropathologists find the nervous system dualistic in nature, while psychologists regress an hundred years to find it "equipotential."

Psychology contains within itself sufficient data to correct these inadequacies and the Summation conception of neural function provides an adequate description of the underlying neural mechanism.

*Some Experiments with Kittens on the Simple Alternation Problem.*

AUDREY M. SHUEY, Washington Square College, New York University.

Nine kittens, 11 to 12 weeks old at the beginning of the experiment, were given from 240 to 1,500 trials each on a modified form of the simple alternation problem. The subjects were required to alternate from trial to trial between touching the plate on the right and the one on the left of the entrance door of a problem box. Six trials were given mornings and evenings with beef and milk as the incentives. Orientation between trials was not allowed since the kittens were lifted from the food box to the top of the cage where they remained for about four seconds between each trial. None of the kittens was able to reach the norm of mastery usually required of animals in the simple alternation problem, *i.e.*, 85 per cent correct over the period of 40 trials with no day's score below 80 per cent. One kitten, however, was able to make a perfect score in 80 per cent of 60 successive trials.

*The Influence of Instructions in Human Maze Learning.* LOUIS W. GELLERMANN, Yale University.

This experiment yields important evidence concerning: (1) the widely accepted claim of Husband that a high relief finger maze is more easily learned than a stylus maze of like size and pattern; and (2) the practice of using verbal instructions with human subjects in comparative maze studies. A new style slot maze was used in which retracing is prevented mechanically. This maze is the same in pattern (U-T) and size as the stylus maze used by Warden and the high relief finger maze used by Husband. Three groups of subjects (70 in all) learned this maze under conditions differing principally in the degree of instructions used. The "Non-instruction" group was given the minimum instructions, "Keep this handle moving," and "Stop." The "Warden" group was trained under conditions identical with those Warden had used, including the same instruction sheet to read, etc. The "Husband" group was trained under the same conditions and with the same instructions Husband had used.

For the "Husband" group the results obtained in terms of trials to learn, error scores, time records, relative difficulty of blinds, etc., are strikingly similar to those obtained by Husband with a high relief finger maze. Also for the "Warden" group the results are essentially the same as those obtained by Warden with a stylus maze. This strongly indicates that the differences in the results found by Warden and Husband are functions of different instructional situations rather than of the finger vs. the stylus maze. A comparison of the data for the "Husband" and "Non-instruction" groups reveals numerous reliable differences, the latter group learning with much greater difficulty throughout. This indicates that instructions should not be used in maze experiments with human subjects if the results are to be used comparatively. The paper includes an analysis of the influence of different degrees of instructions upon various aspects of maze behavior, such as direction tendency and tendency toward alternation. Also it includes an analysis of the functional similarity in maze learning of the minimum instructional situation, "Keep moving"—"Stop" for the human subject and the Hunger-Food situation for the rat.

*Primacy and Recency in the Learning of Visual Diagrams.* LELAND W. CRAFTS, New York University.

The object of the experiment was to discover whether primacy and recency would have significance in the learning of certain visual diagrams. Irregular arrangements of circles and of lines and irregu-

lar figures were divided into four parts. These parts were presented once, in a continuous series; immediate graphic reproduction followed. The factor of the varying difficulty of the parts was controlled by employing a number of groups sufficient to permit every part to be shown in every one of the four possible temporal positions. The results show that with no important exceptions the groups secured higher average scores on the parts presented first and last than they did on those occupying the two intermediate positions. Hence the significance not only of recency but of primacy as well for the learning of this visual material under the experimental conditions here employed seems to have been demonstrated, and the scope of the current generalizations concerning their value may to this degree be extended.

*The Effect of Knowledge of Results upon Muscular Work.*

CHARLES W. MANZER, New York University.

In a prolonged series of muscular contractions how does work performed with knowledge of results compare in amount and in variability with work done without knowledge of results?

Knowledge of results seems to increase the variability of work. The coefficients of variation of contractions performed with knowledge of results are larger than the coefficients of contractions made without knowledge of results. This increase in variability decreases as the work continues.

Data are available which indicate that knowledge of results is followed by an increase in muscular strength which lasts for a considerable period of time.

*Further Studies on the Memory Factor.* ANNE ANASTASI, Barnard College, Columbia University.

The present study is a continuation of an investigation of the memory factor started in 1929.\* In that study, the presence of a common factor was demonstrated through a series of tests of immediate memory for visually presented rote material, using a group of male college juniors as subjects. That study is now extended to cover: (1) other types of subjects, viz., female college sophomores; (2) other test combinations, especially to bring out more clearly the relation between memory and other group factors, such as verbal and numerical abilities; (3) other types of memory, including specifically: (a) logical, (b) delayed, (c) auditory, (d) incidental, (e) memory for movements, (f) memory for tonal sequences. Parts (1) and

\* A Group Factor in Immediate Memory, *Arch. of Psych.*, No. 120.

(2) are now complete; the results are reported in the form of inter-correlations and tetrads and show a remarkable agreement with the earlier study. Part (3) is still in progress; the procedure followed in that part will be described, with no results as yet.

*Ocular Dominance—Is It a Consistent Factor in Behavior? What Are Its Determinants?* HUGHBERT C. HAMILTON and ROBERT J. BEITEL, JR., Temple University.

Notions of ocular dominance as a consistent factor in behavior, analogous to handedness, given to us by Parson and others, led to a search for determining factors. Tests were devised to show relative muscular stability in fixation and in maintaining fusion. These together with the usual tests of dominance, comprising a battery of eight in all, were given to 104 college sophomores, 53 men and 51 women. To these were added tests of acuity and handedness. Results show: (1) Surprisingly high incidence of cases in which it was not possible to determine dominance. (2) Lack of consistency among the various tests, for instance, an individual showing right-eye dominance on one test was almost as likely to show left-eye dominance or indeterminate on another test as to show right-eye dominance. (3) Only a low positive relationship between right-eye dominance and right-handedness. The results seem to suggest that while a preference for the use of one eye may often be demonstrated it may not be a consistent factor in behavior, or that neither the standard tests nor those devised for the experiment are sufficiently selective in regard to eyedness or its determining factors. The experiment has suggested other definite lines of attack upon the problem.

*The Relationship of Oxygen Want to Fatigue and Neurasthenia.* ROSS A. MCFARLAND, Columbia University.

In this experiment an attempt has been made to measure the loss of functional capacity accompanying physiological deterioration due to oxygen want in artificially produced fatigue in normal S's as well as in neurasthenic subjects. As a control group ten normal S's were given a series of eight tests in a low oxygen chamber. The tests were as follows: choice reaction, Ferguson's form boards, mirror drawing, a transliteration test, Moss's wobblemeter, Army Alpha, and a test of neuromuscular control (Guidit). After a practice period each subject took the tests in the following concentration of oxygen: 12 per cent, control or normal atmosphere; 10½ per cent; 9 per cent; and 50 per cent. Five of the normal S's went without sleep for

36 hours and took the tests again at 10½ per cent oxygen. Then the same tests were given to 10 abnormal S's in which the fatigue syndrome was the central difficulty. The neurasthenic S's were affected more quickly at 12 per cent O<sub>2</sub> and especially at 10½ per cent O<sub>2</sub> than the normal S's. Also their relative improvement at 50 per cent O<sub>2</sub> was greater than in the normal S's. Various physiological measurements were made throughout the experiment. The data furnishes controlled measurements of the psychological deterioration accompanying the physiological and points out the close relationship between oxygen want and fatigue as a central factor in certain types of abnormalities where respiratory difficulties and the consequent improper saturation of the blood with oxygen is involved.

*A Technique for the Measurement of Attitudes.* RENSIS LUKERT and GARDNER MURPHY, Columbia University.

In connection with a study of student attitudes on social questions a new technique for the measurement of attitudes has been developed. This method, with fewer items, yields reliability coefficients as high as those reported for other methods and it does not involve any elaborate use of judges to obtain scale values.

In its more elaborate form, which assumes normality and scores in terms of  $\sigma$  deviations from the mean, the scale unit is equal for all parts of the scale. A simpler form of the method has been used almost entirely in this study because of its high correlation with the more elaborate technique (.993 to .997) and because it permits the obtaining of scores more easily and rapidly.

In this method each statement becomes a scale and the final score for an individual is the average of his scores on each of the different statements. There are also mathematical checks for the ambiguity and irrelevance of any statement included in the battery.

*General and Specific Factors in Emotional Adjustment.* J. B. MALLER, Institute of School Experimentation, Teachers College, Columbia University.

A test has been devised for the measurement of several phases of emotional adjustment. The test is composed of 200 items divided into six sub-tests on habits, self-control, social adjustment, personal adjustment, symptoms of neurosis, and readiness to confine. Each item appears twice—in positive and in negative form. It is thus possible to determine whether an item was answered consistently, and to obtain a consistency score.

The test was given to more than 2,000 individuals, including pupils

of the elementary grades, high school, Barnard, Seth Low, City College, and Hunter College. It was also given to 125 inmates in a reformatory for juvenile delinquents, to 210 selected problem cases from a large metropolitan public school, to 80 cases brought before the Children's Clinic of Bellevue Hospital, and to 300 employees (messenger boys enrolled in the Western Union Continuation School and sales girls in a large department store). The test was validated by including in the final form only those items which differentiated between the normal and the deviates who were diagnosed as problems of emotional maladjustment.

Correlations were obtained between the scores on these tests and a variety of factors, including age, intelligence, scholastic achievement, and scores on similar tests such as the Woodworth-Matthews Questionnaire and Thurstone's Personality Schedule.

The tetrad difference analysis was applied to determine whether the scores on the various parts of the tests as well as the derived consistency scores may be considered as due to a general factor of emotional adjustment coupled with specific factors. The analysis revealed that some of the tests satisfied the tetrad difference criterion while others did not. The various attempts at measuring emotional adjustment are reviewed in the light of this analysis.

*Beauty as Related to Intelligence and Scholarship.* ANNA M. MOHR, Temple University.

To determine the relationship between beauty and intelligence and beauty and scholarship: (1) in the case of girls; (2) in the case of boys.

Twenty-five sophomore girls—identified by numbers and unknown to the judges—were ranked in order of merit for beauty or attractiveness, *first*, by 12 girls judges, and *second*, by 12 boy judges. Proceeding in the same way, 25 sophomore boys were ranked for the same trait by the same judges.

Consensus ratings (1) for the *girls*, (a) as judged by the girls, (b) as judged by the boys, and (2) for the *boys*, (a) as judged by the girls, (b) as judged by the boys, were computed on the basis of ratings obtained from individual judges. These consensus ratings for attractiveness were then correlated with ratings of the same subjects on an intelligence test and with their ratings for scholastic achievement. The ratings for scholarship were based upon grades received in fifteen courses or in 45 hours of college work.

*Results*

	Corr. for girl S's	Corr. for boy S's
<i>Beauty</i> (combined ratings of girl and boy judges) and <i>intelligence</i> .....	+.34	+.23
<i>Beauty</i> (girl judges) and <i>intelligence</i> .....	+.34	+.21
<i>Beauty</i> (boy judges) and <i>intelligence</i> .....	+.29	+.19
<i>Beauty</i> (combined ratings of girl and boy judges) and <i>scholarship</i> .....	+.29	+.30
<i>Beauty</i> (girl judges) and <i>scholarship</i> .....	+.39	+.27
<i>Beauty</i> (boy judges) and <i>scholarship</i> .....	+.20	+.33
<i>Intelligence</i> and <i>scholarship</i> .....	+.56	+.51

The boys were less variable (as measured by A.D.) in rating the girls for attractiveness, than the girls in rating the girls. Similarly, the girls were less variable in judging the boys for this trait, than the boys in judging the boys.

*The Learning Capacity of a Group of Illiterate Native Born Adults.*  
J. W. TILTON, Yale University.

A four week summer school is conducted by the South Carolina State Department of Education for adults who have not completed the elementary school. In 1931, the progress made by 253 adults in reading, writing, arithmetic, and spelling, was measured in order to find out how much the illiterate could learn.

For administrative reasons, the 253 students were divided into four groups: Group I—47 negroes, in grades 1-3; Group II—47 whites in grades 1-3; Group III—65 whites in grades 4 and 5; and Group IV—94 white students in grades 6-8.

Tests standardized for use in public schools were used in measuring progress. Two group intelligence tests were administered to the entire group, and these were validated against two individual tests in fifty cases.

The four groups were ranked in the same order when ranked for average gain, and for average mental age, the order from low to high being the above order of mention.

It was concluded that the relatively small gains reflected relatively low native capacity, and that the illiterate of the group were so, not wholly because of lack of educational opportunity, but in part because of relatively low native capacity for learning.

*A Study of the Incidence of Feeble-mindedness Among Children Examined in the Psychological Clinic of the University of Pennsylvania.* MILES MURPHY, University of Pennsylvania.

More than 9,000 cases have been examined in the Psychological Clinic of the University of Pennsylvania since it was established 35 years ago. The present study is a year by year analysis of the number of cases in which a diagnosis of feeble-mindedness was made during this period, excepting those cases examined primarily because of a speech defect or for vocational guidance. It serves to indicate the changing function of the Psychological Clinic in the field of psychology and in the community as well. The study shows that there has been a steady decrease in the number of feeble-minded examined during this period with a corresponding increase in the number of normal children. The differential diagnosis within the normal group for educational and correctional guidance is displacing the diagnosis differentiating between normality and deficiency. Within the last decade there has been an increasing demand for the examination of superior and talented children.

*Psychopathology of Time.* NATHAN ISRAELI.

A new viewpoint advanced in recent psychopathological literature abroad aims to interpret various psychoneuroses and psychoses in terms of time or space-time disorientation. Prominent among the leading proponents of this view are Janet, Minkowski, Fischer, and others. In a series of lectures in 1928, Pierre Janet reunited different aspects of his previous contributions having as a central theme the notion of orientation of time as the basic disorder. Thus, many of his former cases, such as that of *Irene*, are reinterpreted. Since 1923, E. Minkowski, a French psychiatrist, has been at work on major psychoses and has tried to show that the fundamental abnormalities are not so much emotional or psychomotor as they are primary space-time disorders. His views are based on the philosophic views of Bergson and on the phenomenology of Husserl. Recently, 1931, Franz Fischer, a German psychiatrist, paralleled Minkowski's interpretation of schizophrenic cases with his own observations and also indicated that the basic disorder is a space-time one. This work is in the preliminary stages. There may be too much *reading-in* interpretation of cases and lack of statistical control. But certainly, this work is suggestive of much constructive and scientific work. In this country, recently, Dodge and Kahn pointed to the importance of time in psychopathology. There is very little extant work on estimation of time in the literature of psychiatry. And there are hardly any

objective data. Janet, Minkowski, and Fischer emphasize indirectly the necessity for objective data in a study of time-orientation in the classical clinical pictures.

*Clinical Procedure as a Method of Validating a Measure of Psychoneurotic Tendency.* JOS. V. HANNA, New York University.

A total of one hundred seventy-nine subjects who passed through a psychological-vocational clinic were classified, on the basis of a wide range of information, as to the extent of emotional stability. These same subjects were given the Thurstone Personality Schedule, and classified as to their emotional stability on the basis of ratings obtained. Schedule ratings were then compared with classifications on the basis of clinical diagnosis. Subjects diagnosed as representing different degrees of emotional instability, as a group, rated conspicuously higher on the Schedule than those classified as normal. Those subjects who were classified as being slightly abnormal ranked slightly above average on the Schedule, whereas those who were recognized as so seriously maladjusted as to need the services of a psychiatrist showed an average rank of approximately 75, which is approximately 40 points higher than the average score submitted by Thurstone.

*Dementia Praecox—A Psychological Study.* HARRIET BABCOCK, New York City.

In a study of one hundred thirty praecox patients who were not extremely deteriorated but were very coöperative and able to do all the tests in the series, it was found on comparing them with normal subjects of the same mental levels that they showed marked mental inefficiency as shown in their ability to perceive and fixate new data.

Less than normal efficiency was shown by all praecoxes including those who were described as showing no intellectual defect and simple praecoxes, who are said to be distinguished from the feeble-minded only by their histories.

The conclusion was drawn that the peculiarities of the praecox group are due to mental inefficiency which is beyond their control and that the reason mental defect is not noted in the early stages is because we have not had instruments of sufficient precision with which to measure it.

*Recent Developments in the Psychology of Advertising.* HENRY C. LINK, The Psychological Corporation.

The Psychological Corporation with the help of its representatives in fifteen cities between New York and Denver, Montreal, Canada,

and Lexington, Kentucky, has been conducting an experiment in *advertising familiarity*. The study was based on a questionnaire given to approximately two thousand housewives and asking such questions as:

What refrigerator is *Dual Automatic*?

What toothpaste advertises *Pink Toothbrush*?

What company and canned fruit advertises *Just the Center Slices*?

What company advertises "I Smell Smoke"?

The results from twenty questions of this kind indicate a remarkable range of effectiveness for different advertisements and advertising campaigns. The correct answers are as low as 20 per cent, 30 per cent and 40 per cent of the total number of housewives asked in regard to certain campaigns, and as high as 50 per cent and even 75 per cent in other cases. These large differences raise some interesting questions in regard to different types of advertising.

The method used was that of *unaided recall*, which is free from the many difficulties and possibilities which beset the recognition method or methods of aided recall. The accuracy of the technique used is proved by the remarkable consistency in the results obtained so far which, incidentally, are a fine tribute to the ability of psychologists in widely separated locations, to use a prescribed technique with accuracy and uniformity.

A certain number of companies have become very much interested in this experiment and a few have contributed toward the expense of carrying on the study and preparing the report. It is hoped that the practical value of such studies will become more apparent as time goes on. In the meanwhile, they serve as an interesting means of stimulating the practical applications of the psychological technique in the field of advertising among professors of advertising and business psychology and their students.

PROCEEDINGS OF THE SEVENTH ANNUAL MEETING  
OF THE MIDWESTERN PSYCHOLOGICAL  
ASSOCIATION, MAY, 1932

HORACE B. ENGLISH, SECRETARY, OHIO STATE UNIVERSITY

The Seventh Annual Meeting of the Midwestern Psychological Association was held May 13 and 14, 1932, at the University of Indiana under the presidency of Professor Herbert Woodrow, University of Illinois. Although only about 250 were registered, attendance at several of the sessions exceeded 350. On Friday evening a symposium on Learning was held. Professor R. H. Wheeler of Kansas University spoke on "Gestalt psychology and learning," Professor E. A. Culler of the University of Illinois on "The double rôle of the primary stimulus in conditioning," and Professor Joseph Peterson of the Peabody College for Teachers on "Some developments in the psychology of learning in the last thirty years." Discussion of Professor Wheeler's paper was opened by Professor J. A. McGeoch of Missouri and continued in very vigorous fashion by a number of speakers. Professor H. B. English led the discussion of Professor Peterson's paper. On Saturday afternoon the custom was continued of having informal reports of work in progress. This session was under the vigorous chairmanship of Professor C. A. Ruckmick of Iowa.

At the business meeting it was voted to hold the next meeting of the Association at Iowa State College, Ames. A special honorarium was voted the retiring Secretary-Treasurer. Professor Carney Landis was appointed to represent the Association on the Council of the A.A.A.S. The report of the Secretary showed a steady growth in the membership, with 299 members paid up. A small surplus is being slowly built up in the treasury.

The Program Committee, consisting of S. Renshaw, J. P. Porter, W. L. Valentine and the Secretary, reported that over ninety abstracts of papers were received. Of these only 38 could find place on the program and this only by holding parallel sessions. The most cordial and sincere thanks of the Association for the smoothly running arrangements were tendered President Bryan, Professor Book, and the members of the Department Staff of Indiana University.

About 250 persons attended the Annual Dinner in the beautiful

new Union Building on the Campus. Professor Woodrow's presidential address, which will be published separately, was on the "Temporal Indifference Interval."

New officers elected are:

President, 1932-33: Horace B. English, Ohio State University.  
Secretary-Treasurer, 1932-35: John A. McGeoch, University of Missouri.

Member of Council, 1932-35: Floyd C. Dockeray, Ohio State University.

*An Empirical Comparison of Audition, Vision and Touch in the Discrimination of Short Intervals of Time.* LOUIS D. GOODFELLOW, Northwestern University.

Differential sensitivity to intervals of time one second in length was studied for three sense modalities: audition, vision, and touch. Eighteen O's took part in this research making a total of 14,000 judgments by the method of Right and Wrong Cases; 1,000 estimates by the method of Reproduction, and 1,000 judgments by the method of Just Noticeable Difference. All three approaches to the problem showed that audition gave the keenest differential sensitivity; was least variable and most reliable. Vision gave the exact opposite and touch lay between audition and vision on all three scores. The threshold values obtained by the method of Right and Wrong Cases were slightly greater, and for the Just Noticeable Difference method, slightly but consistently lower—the difference being about twenty sigmas.

*An Experimental Comparison of Psychophysical Methods.* J. P. CARTZDAFNER, Ohio Wesleyan University.

An experiment in the discrimination of visual extents was performed on a specially designed Galton bar. Using the method of limits, average error, and constant stimuli, ten observers made 5,100 judgments of a standard length of 200 mm. Three different mathematical processes were used to calculate the value of the threshold in the constant method. The arithmetical mean of the just perceptibly and just imperceptibly different points was adopted as the criterion for the threshold in all three methods. Within the limits of the experiment, the following conclusions were drawn:

1. The process of computing the value of the threshold in the constant method by using the formula of the arithmetical mean is just as reliable, and is much simpler than either the phi-gamma process or Urban's limiting process.

2. An assumption as to the limits of the tail distributions in the

constant method can be verified within the limits of the experimental error.

3. From the viewpoint of *accuracy* of threshold determination, the methods rank as follows: first, the constant method; second, method of average error; third, method of limits.

4. From the viewpoint of *consistency*, the methods rank as follows: method of limits, constant method, method of average error.

*The Evidence for a Theory of Neurological Maintenance of States of Emotional Motivation.* ROBERT LEEPER, University of Arkansas.

In contrast with the customary theory that states of emotional motivation are maintained primarily by patterns of muscle tonus, it appears that (1) the nervous system has the characteristics necessary for a neurological maintenance of motivation—namely (a) the anatomical structure for intra-cerebral circulation of nervous impulses, and (b) the capacity for extending considerably the amount of nervous activity of successive stages of the reflex circuit—and (2) the cases cited by Cannon in support of his thalamic theory of emotion have one implication apparently overlooked to date—namely, that the thalamic emotional-reflex centers of Cannon's theory must be capable of continued activity in the absence of visceral reinforcement. The mechanism of such neurological maintenance is most probably a circulation of nervous impulses between the cortex and these thalamic centers. Furthermore, it seems that emotional motivations are possibly subject to modification by training either through direct modification of the emotional-reflex centers of the thalamus or through the development in the cortex of mechanisms analogous in function to the thalamic centers. Each of these points suggested seems open to objective experimental investigation.

*The Effect of Various Stimuli on the Basal Metabolic Rate, the Blood Pressure, and the Galvanic Skin Reflex in Man.* E. ROWLES and J. R. PATRICK, Ohio University.

Using the Benedict-Roth Metabolism apparatus, the Tycos sphygmomanometer with a reducing capsule and tambour, and the Hathaway psychogalvanometer with the Ruckmick photographic apparatus attached, the experimenters ran a series of control tests: first basal alone, second, basals with sphygmomanometer and other apparatus attached and operating. After several records under normal conditions were taken the subjects were subjected to various stimuli of a "sensory" and "ideational" nature to note the effect

of these stimuli on the basal metabolic rate, the blood pressure, and the galvanic skin reflex. Male college students, with one exception, were used as subjects under rigidly controlled conditions. The results so far obtained from this preliminary investigation seem to show that (a) all subjects, with one exception, show an increased basal metabolic rate, varying from about 9 per cent to 38 per cent over the average normal basal and control basals, when subjected to various stimuli that supposedly have an emotional effect; (b) blood pressure changes occur following application of most of the stimuli; (c) while data are not as complete on the galvanic reflex, the data that have been secured show deflections of varying degrees following application of the stimuli; (d) whether the peripheral changes occur first, later followed by more deep-seated changes as cardiac and metabolic, we have yet to determine more precisely; and again whether this technique will differentiate the effects of the various stimuli is yet to be determined.

*Adrenalin and Emotion.* CARNEY LANDIS, New York State Psychiatric Institute, and W. H. HUNT, Dartmouth College.

Report to be published in full in the *Psychological Review*, September, 1932.

*Electrophysiology of Mental Activities.* EDMUND JACOBSON, Department of Physiology, University of Chicago.

Apparatus had been developed to measure transient potential differences as small as one millionth of a volt. With this it has been possible to test for and measure neuromuscular states during mental activities such as recollection and imagination, visual, auditory and kinesthetic. Specific muscles have been found to contract during each type of mental activity so far investigated.

*Clinical Psychology in Industry and the Professions.* MARY H. YOUNG, Indiana University.

An account of a clinic which aims to assist those who are fundamentally stable and of considerable ability but who have personal problems of an essentially psychological nature.

*Relation of Personality Traits to Academic Aptitude and Achievement.* ROSS STAGNER, University of Wisconsin.

An analysis of the results of testing 250 freshmen men with the Bernreuter Personality Inventory shows the following results: none of the personality measures given by the test is significantly correlated with intelligence or grade-point average; students selected as

possessing undesirable personality traits (high neurosis, low self-sufficiency, low dominance) show markedly lower correlations of grades with intelligence than contrasted students at the other ends of the respective distributions; students achieving lower grade-points than commensurate with intelligence scores manifest higher neurosis and self-sufficiency scores than those achieving more; it is indicated that personality traits may interfere with the successful use of intelligence.

*A Study in Rating Technique with Special Reference to Activity in Preschool Children.* HELEN LOIS KOCH, University of Chicago.

An attempt was made to devise a method of quantifying descriptions of individual differences in activeness among preschool children which would combine some of the merits of gross ratings and of the frequent short-sample method of observing and evaluating personal qualities. As sub-problems in the investigation were the following: Is there evidence for a general factor of activeness? Does the relative standing of the individual vary with the pursuit in which he is observed? Are activeness or energeticness functions of sex, time of day, humidity, and temperature?

Fifty preschool children were observed in nine types of pursuits. Ratings on the activity displayed in each occupation by each child during two successive half minutes were made about once every four days until about 30 judgments had been obtained. Correlating the means of the ratings given during immediately successive half minutes yielded for the various occupations reliability coefficients of  $+.73$  to  $+.96$ , whereas the reliability coefficients based on alternate minutes of observation ranged from  $+.44$  to  $+.74$ . It appears, hence, that for an equally homogeneous group about  $1\frac{1}{2}$  hours of observation distributed properly in one minute intervals would result for most occupations in indexes of activeness adequate for individual diagnosis. That the method employed can give similar results in the hands of different experimenters is demonstrated by the fact that scores based on the judgments made by two relatively untrained O's observing simultaneously and independently for a few weeks correlated from  $+.90$  to  $+.97$ .

The correlations between measures obtained in the various pursuits were not high, however, even when corrected for attenuation, the mean being about  $+.30$ . This fact suggests the danger of using a child's behavior during one type of occupation as an index of his behavior during all others.

Mental and chronological age seem not strikingly related to any

of the nine measures of activeness achieved, except one. Partialling out the influence of these maturity and general ability factors leaves interactivity correlations of a degree to be reckoned with. Whether these are to be attributed to a general or to specific factors we were not able to determine.

The boys studied were more active than the girls. Activeness seemed to be influenced in a complex way by temperature but not by humidity in the ranges observed.

*An Analytical Study of the Expressive Use of Language by Preschool Children.* H. M. WILLIAMS, University of Iowa.

There is at present a need for a series of broader experimental studies of the development of language as a whole at the preschool level. Such studies should result in a better functional understanding of the growth of language and better methods of rating the development of the individual. The techniques were: (1) a test of the ability to produce speech sounds, (2) a phonetic transcript of language usage in communicative speech, and (3) vocabulary tests. All of the techniques were shown to have a reliability and objectivity fairly adequate for individual differentiation.

It was found that, (1) development in the mechanics of speech showed considerable independence of the other language functions and of general intelligence; (2) measures of the organization of language into expression units showed high integration; (3) vocabulary tests showed considerable independence of the other language skills, and (4) the average correlation between the language measures and intelligence were of the order of .60, showing considerable specialization of function of language.

*A Scale of Block Constructions for Young Children.* MARJORY W. BAILEY, Ohio Wesleyan University.

The purpose of this study was to devise a scale with which block constructions of nursery school and kindergarten children could be compared and evaluated.

Photographs were made of constructions built by 44 children ranging in age from two years, two months, to nine years, eight months. These were ranked twice by 100 adults using the method of equal appearing intervals. On the first trial half of the judges used as criteria, plan and achievement of plan, and the other half, symmetry of design and care in placing the blocks. Approximately a week later both groups ranked the pictures again, the first group using the second criterion and the second group using the first.

Cumulative frequency curves were drawn for each trial for each picture and a scale value, the median position for the picture, and the interquartile range, were determined directly from the graph. The average scale values and Q-values for the two groups when using the same criterion were used in constructing the scales since the average variability and the reliability for each trial were almost identical, and the differences between the scale values derived from the judgments of the two groups were negligible.

Although there was a correlation of  $.81 \pm .035$  between the scale values obtained on the two criteria, there was a statistically reliable difference between the scale values of 15 of the constructions, therefore different scales were constructed for each criterion.

Photographs of constructions were selected for the scales which were as equally spaced as possible but which had low measures of variability. There are 10 photographs in each of the scales and both have the same range. The approximate reliability of the scale values of the constructions selected for one scale is, on the average, .10 scale unit, and of the other, .09 scale unit. Arbitrary values, 10, 20 and so on to 100 were assigned the series of photographs in each scale.

*The Picture Element in Certain Tests.* FRANCIS N. MAXFIELD, Ohio State University.

Some tests like the Healy-Pintner mare and foal test and the Merrill-Palmer puzzle pictures involve form as well as pictures. When the pictures are removed, the form remaining the same, children complete these tests as easily as before. A new feature profile test which is a true picture test was devised; also an inexpensive graded series of picture completion tests for preschool children.

A report of a number of unpublished minor researches in this field by graduate students at the Ohio State University.

*Variations in Strength of Emotional Responses of Newborn Infants.* DOROTHY GOHRING, University of Wisconsin.

Sixty-one infants from one to ten days of age were stimulated by restraint-of-arm-activity and by loss-of-support by jerking. Motor and vocal responses and color change of face were noted and scored on five-point scales for strength of response. Jerking was found not to be an adequate stimulus to emotional behavior, the startle response seeming to be a righting reflex to regain balance. The strength of response, excepting motor response to jerking the results for which were inconsistent, decreased with sleepiness and increased with hunger. Responses to holding increased with age.

*Quantitative and Qualitative Essential Elements of Transfer.* FRED MCKINNEY, University of Missouri.

Seventy-five subjects were trained to associate simple geometric figures with letters of the alphabet to a given criterion. One of the figures was then altered in fifteen different ways and scattered among the other unaltered ones. The alterations consisted of 10 per cent, 20 per cent and 30 per cent quantitative reductions. They were both symmetrical and asymmetrical and were located in different parts of the figure. The transfer to these altered forms was measured in terms of percentage of incorrect response as well as the amount of variability of response. The results show that symmetry is more effective than size in transfer and that the response to a given quantitative alteration varies markedly with the locus of variation or the qualitative aspect of the stimulus—put in other words, identity of form is more important than identity of elements as a transfer stimulus.

*The Relative Retention Values of Stylus and Mental Maze Habits.*

R. H. WATERS and GRACE B. POOLE, University of Arkansas.

The results of the experiments described may be summarized as follows: (1) The relative retention of what have been conventionally called "motor" and "verbal" habits is a function of the relative degree of learning of the two habits compared. (2) The analysis of the data of the experiments indicates that the two habits compared, the stylus and mental maze habits, have much in common in terms of their verbal components. (3) The results indicate that the acquisition of a verbal or some analogous symbolic pattern is the significant feature in stylus maze learning.

*Learning and Time.* GEORGE S. SNODDY, University of Indiana.

An experimental study of learning employing a highly controlled form of mirror-tracing is presented to show that learning is an increase of stability or capacity to withstand stimulation. This increase of stability is shown to depend upon passing of time, and is further reducible to increase of entropy. The attempt is made to show the identity between the learning and the entropy increment in the Boltzmann-Planck statistical conception.

*The Influence of Variable Inter-cyclic Intervals on Pursuitmeter Learning, and a New Method of Treating Learning Data.* WILLIAM SCHWARZBEK, Ohio State University.

These studies were made in order to determine the influence of (1) the length of the inter-cyclic rest periods, and (2) the relative

massing and distribution of the practice on the acquisition of pursuit-meter skill. Twelve groups of subjects (86 individuals) learned the skill in 36 four-minute practice cycles. Each group worked under different conditions of inter-cyclic rest and distribution of practice.

By determining those groups of learners which first reached an arbitrary minimum of errors, it was found that three sittings of three cycles each is an optimum distribution. Learners resting nine or five minutes between practices progressed more rapidly than those who had less rest. A series in which the rest periods became progressively shorter was superior to a series in which the order of progressive change was reversed.

These findings oppose those learning theories which hold that correct responses are reinforced at the time they are made, as well as those which hold that strength of connections and time between repetitions are inversely related.

*The Phenomena of Off-Season Learning.* COLEMAN R. GRIFFITH,  
University of Illinois.

William James is probably responsible for perpetuating the belief that a certain measure of increase in skill may take place after the cessation of formal practice. Moreover, the argument carried in the old saying that we learn to skate in the summer time and to swim in the winter time is commonly made by athletes. It has been possible to examine this argument by measuring, in successive years, the initial, maximal, and final skills of basketball players, tennis players, baseball players and golfers. The same subjects can be used for a period of four years under a training program that has been maintained constantly enough to make successive athletic seasons resemble a well controlled experimental period. An analysis of data covering five seasons shows that, with respect to certain technical skills, the phenomena of off-season learning do not exist. The data suggest, however, that a distinction must be drawn between the technical skill possessed by an athlete and the judgment which he may use in making his technical skill serviceable in actual playing situations. Some evidence has been found to show that good judgment may increase during off-season periods. Supporting experimental evidence suggests that athletes with smaller relative measures of technical skill may actually use such resources as they have in more appropriate ways so as to defeat opponents who have higher measures of technical skill. Correlating this experimental evidence with the observations first described raises questions as to the nature of technical skill, the nature of good judgment, and the relationship between them.

*An Experimental Study of Thorndike's Theory of Learning.*  
MARGERY HAYDEN, University of Wisconsin.

This study of Thorndike's explanation of learning by the law of effect is a modification of an experiment reported by him in the *American Journal of Psychology* for 1927 and in his book *Human Learning* in 1931.

The experiment consisted of having blindfolded subjects draw three-inch lines. The following conclusions appear justified:

1. There was no improvement in the efficiency of drawing three-inch lines when no outside check was given, that is, when the experimenter said nothing after a line was drawn.

2. When the experimenter spoke a nonsense syllable after each line was drawn, the subjects' attention was distracted and they were less successful than those subjects to whom nothing was said.

3. There were more correct responses and a smaller average error in the lines drawn by the subjects who were told exactly how much each line deviated from the correct line than in the lines drawn by subjects who were told "Right" or "Wrong" after each line was drawn. This suggests that the factor of satisfyingness, if it is important, is not the only factor which explains the subjects' improvement.

4. Questions asked the subjects after the experiment indicated that the subjects used various cues to aid in repeating the correct response. The principal cues were kinaesthetic, sound of pencil, and counting to measure the time-interval.

*The Relative Rôles of Wave-Phase and Acoustic Intensity in Sound-Localization.* OTIS C. TRIMBLE, Purdue University.

The purpose of this investigation was to determine: (1) the frequency limits and conditions of the effectiveness of each of the two factors under consideration; (2) the influence of phase-differences on extreme lateral localization conditioned by intensive difference; (3) the influence of intensive differences on extreme lateral localization conditioned by phase-difference; and (4) the effectiveness of both factors when presented together in the same direction.

It was found: (1) That intensive differences are effective for complete lateral displacement throughout the frequency range investigated, while phase-differences are so effective only up to approximately 1,000 cycles, above which point the effectiveness of phase becomes less and less until it plays out entirely in the neighborhood of 3,000 cycles. The phenomenal tones were described as being much more complex, consisting of more than one fusion, under conditions of phase-difference than under conditions of intensive differences.

(2) That phase-differences have only a slight influence on the effectiveness of intensive differences, regardless of the frequency conditions or the direction of variation of the two factors.

(3) That intensive differences tend to overcome this effectiveness of phase either by conditioning much the normal "intensity-effect" or by breaking up the phenomenal sound into two or more fusions or "phantom" sounds.

(4) That phase and intensity are not as effective when presented together under the conditions of the present experiment, as either factor presented alone.

*Pioneering in the Diagnosis of Infantile Pseudo-Deafness Through Sudorific and Other Reflexes.* HELEN F. SCHICK, Central Institute for the Deaf, and MAX F. MEYER, University of Missouri.

The complex problem of distinguishing true deafness from that pseudo-deafness which results from retarded cortical maturation may be approached on the basis of: (1) A simple, vital, non-cortical habit which is environmentally formed in response to sound. Failure to form this habit would indicate true deafness. (2) Observations of regular bodily functions such as (a) neuro-muscular action current; (b) the sudorific reflexes; (c) respiration; (d) blood pressure.

The development of the discriminatory habit by training a child to refuse to accept unnatural food when warned by an alternation of two tones and to immediately accept good food accompanied by the mere repetition of a single tone was our first approach. Our more recent approach is a study of the two sudorific reflexes when stimulated by sound, namely, (a) a secretory reflex, which is chemical; (b) an ejaculatory reflex, which is muscular. Their innervation is not identical and this function can be measured by the galvanometer only indirectly.

Electrodes were attached to both feet of the infants for galvanometric records of an externally-produced current. General muscular contraction could be observed directly. The stimulus was a whistle.

The glands are tubular. The ejaculating contraction of the spiral muscles of these tubes establishes no new electrical conduction, as no sweat threads are broken, hence there is no immediate change in the galvanometer record. Relaxation of the ejaculating fibers may suck some non-conductive air into the surface perforations, or may permit them to collapse. This is registered as a drop in current in proportion to the number of sweat threads broken and occurs in about three seconds.

Six to eight seconds later a secretory reflex makes sweat rise in

the tubes, reestablishing and newly establishing electric conductive functioning through the horny layer of the skin. This means galvanometric recovery and even rise of current. But neither an "electric" nor a "psychic" phenomenon played a rôle in our work. We are now attempting to diagnose through the sudorific reflexes true deafness and pseudo-deafness in infants.

*The Effect of a Constant Visual Angle on Binocular Depth.* LLOYD S. WOODBURN, University of Michigan.

H. J. Howard in 1919, Andersen and Weymouth in 1923, and N. M. S. Langlands in 1929 had all found the limits of binocular resolution to be around 2" visual angle. They had, however, assumed that the judgments were free from the influence of the change of the size of the retinal image. This would change normally with the actual distance of the object.

It was determined to test whether this assumption was correct or not. An apparatus was designed and built which would so increase the size of the object as it receded and so decrease the size of the object as it approached that the size of the image on the retina was the same at all times. The effect of perspective was eliminated by having the distance between the objects increase as the exposure boxes were moved farther and farther away from the subject. The head was held firm by the teeth grip and the light source was a pair of neon tubes.

After a five hour practice period, results were recorded on each of eight subjects. The method of constant stimuli was used with the addition of both the Ascending and Descending orders from the smallest interval used to the largest. These results were then tabulated as to the frequency of the three kinds of judgments, far, equal, nearer. From these tabulations curves were drawn and the value represented by the 50 per cent line was taken as the score in each case. These figures when translated into the difference of visual angle average 2.1" for the eight subjects. From this it is evident that the size of the visual angle is not a necessary cue in the binocular discrimination of depth differences.

*The Distortion of Stroboscope Figures.* ROBT. F. WALLACE, Ohio State.

Photographs of the revolving drum were taken, and lantern slides of the pictures prepared. These slides showed that the distortion is apparent to the eye of the camera and thus rule out explanations that say the distortion is an illusion in the usual sense of the word.

A review of the literature revealed that but one paper dealt with this particular phase of the stroboscope, and that was in German by Paul Linke (*Psychol. Studien*, 1907, 3, 393-545). Linke worked out a formula for the distortion involving the relative velocities of the stroboscope figure and the slit that moves before the eye. Speed was measured by visual angle per unit of time and the size of the slit was not taken into consideration.

An analysis of the situation was made by the writer in which the drum was considered stationary and the eye of the observer considered to revolve around the drum at a constant velocity. The relative conditions are the same as in the usual situation, and the advantage lies in the facility of application of geometry to the problem. By slides showing the situation the amount of the distortion is worked out in terms of the size of the figure, the size of the slit in the drum, the radius of the drum, and the distance of the eye from the face of the drum.

*Visual Acuity and Illumination.* WARREN W. WILCOX, Psychology Laboratory, University of Kansas.

The visual acuity was tested by finding the least perceptible interval between two bars of constant width but variable separation. Different types of curves were obtained in the case of object intensity and of background intensity. Visual acuity is thus shown to depend not only on intensity but also on the particular type of organization of the test object.

*Comparative Tests on a Human and a Chimpanzee Infant of Approximately the Same Age. A Motion Picture Demonstration.* W. N. KELLOGG and L. A. KELLOGG.

With the assistance of Professor Robert M. Yerkes of Yale University and of the Social Science Research Council, the writers adopted an infant chimpanzee, age 7½ months, and raised it with their own child, who was 10 weeks older than the ape. It was the specific aim of the undertaking which continued for a period of nine months to give the animal the identical environmental advantages which the child enjoyed *down to the last detail*.

In the majority (but not all) of the tests and experiments attempted the ape proved generally superior to the child. This was notably the case in learning ability and memory. The results seem to point strongly to the striking importance of environmental influences in its development. Motion pictures shown with the report demonstrate some of the findings in eight of the tests made during the first half of the period of investigation.

*Studies in Concept Formation: II. Some Visual Discriminations Obtained with a New Multiple Type Jumping Apparatus.* PAUL E. FIELDS, Stanford University.

In the last 5 years I have given 84 white rats 165,000 trials on 7 different types of discrimination apparatus. We have developed one in which 5 designs could be simultaneously exposed, providing for the control of a number of variables not possible with the two-choice variety. With it figure discriminations were established in one-half the time needed for the same patterns in any other apparatus, probably because the rats were forced to rely almost entirely upon visual stimuli and were not given the opportunity to develop other sensory channels. Seven months later rats trained on the multiple apparatus were superior to those trained on the two-choice apparatus.

*Functions of the Superior Colliculi in Vision.* JOHN D. LAYMAN, University of Chicago.

Light-darkness discrimination in rats can be learned in the absence of the occipital cortex or of any other third of the cortex. This indicates that perhaps subcortical visual nuclei are involved in this visual habit. The superior colliculi were injured or destroyed in 30 rats by a knife. Training in the Yerkes light-darkness discrimination apparatus and Lashley's jumping apparatus for brightness and pattern discrimination was then carried out. Histological post-mortems were made. The results show that lesions in the superior colliculi produce retardation in learning, as measured by trials and errors made in learning habits of light versus darkness and brightness discrimination, but that habits of pattern discrimination are unaffected. Moreover, rats with lesions in the superior colliculi are more reluctant to jump than normal animals or animals with purely cortical injuries.

*Retardation from Cerebral Lesion in Mazes Differing in Complexity.* K. S. LASHLEY and L. E. WILEY, University of Chicago.

Four groups of animals with approximately equal amounts and loci of cerebral destruction were trained each in one of four mazes with 4, 8, 12, and 16 culs de sac. One hundred twenty-seven operated and 60 normal controls were used. All were subsequently trained on another maze with 8 culs de sac. The degree of retardation is best described as an exponential function of the extent of lesion. The relative difficulty of mazes differing only in number of similar elements is the same for normal animals and for animals with learning

capacity markedly reduced by cerebral injury. There is no difference in the relative difficulty of the mazes for animals with slight and those with extensive lesions.

*An Apparatus for Olfactory Discrimination in Rats.* HOWARD G. SWANN, University of Chicago.

In the two opposite entrances of a food compartment are placed small interchangeable boxes, each of which is filled with dry odorless wood-shavings and one of which can be blocked off. The animals dig their way through the shavings in order to reach the food; when trained, they avoid digging in the box with the negative odor. Thirty animals took an average of 114 trials to complete 27 correct discriminations out of 30 attempts. The odors used were oils of anise and "Dip and Disinfectant," each diluted to 20 per cent. About one animal in 30 fails to learn; the habit is stable and well retained. Extensive controls of all extraneous cues and excision of the olfactory bulbs, histologically confirmed, verify that olfaction is involved.

*Cannibalism in Dogs.* E. S. GIRDEN, University of Illinois.

Sherrington has stated that few dogs, even when hungry, will eat dog flesh. To test the matter experimentally, small pieces of dog-flesh were presented repeatedly to a group of eleven dogs. Raw cow flesh and "Ken-l" ration served as control foods. Evidence for the aversion was found in 5 of the 11 animals. Of these 5 the aversion was not permanent in 3, for with repeated feedings and use of strong hunger (in one case) the negative reactions disappeared. The experiment shows that some dogs do have an aversion to eating raw dog flesh, but that the aversion is by no means universal. The aversion in some cases can be destroyed. The aversion appears to have an olfactory basis; when the meat was cooked, all animals ate it.

*Laws Governing Variations with Repetitions of Equivalent Test Forms.* EDWARD B. GREENE, University of Michigan.

Four equivalent forms were devised for measuring performance separately on four levels of complexity of aiming, pencil mazes, and feature discriminations tests. When measured in equivalent units a fairly large sample of the Detroit area showed the following tendencies in variation between the very simple and the complex tasks. The simple tasks showed less improvement and less variation than the more complex. The simpler tasks showed a closer grouping (smaller S.D.s) on the fourth trial than on the first trial. The opposite was true for the more complex tasks. The simpler tasks showed

higher correlations between subsequent trials than the more complex. In explanation of these results, subject reports indicate very little change in fatigue, but numerous changes in motive and method.

*Oberlin Grades Its Students in the Registrar's Office.* MAX F. MEYER, University of Missouri.

Most or all colleges, in addition to graduating students, give to a select number of them monetary gifts or gifts of social prestige. The selection is facilitated by assigning to every credit hour a 90 per cent, 80 per cent, etc., mark, or an A, B, C, D, E mark. Nearly 25 years ago, the University of Missouri gave to these marks an approximate scientific meaning by officially frowning upon excessive percentages of any of these marks. The effect was good. But 10 years of struggle to induce the faculty to substitute for this hidden ranking method an obvious ranking method were futile. Now Oberlin has performed the miracle and has adopted a straight ranking method for passing grades. But Oberlin is inconsistent, when it hesitates to report a plain average rank per cent for transfer to other colleges. The conversion table published in the *Journal of Higher Education* is totally unjustifiable. It is totally arbitrary. Oberlin ought to have the courage to report to other colleges and to parents the average rank per cent of the student and nothing else.

*The Reliability and Validity of Certain Physical Tests Compared with the Reliability and Validity of Mental Tests.* DOROTHY BEISE, Ohio University.

The first part of this study is concerned with finding the trend of reliability of a battery of physical tests and discovering how such findings compare with established reliability findings of various intelligence tests. Techniques employed were those which are commonly used in colleges when administering such examinations.

The battery of tests consisted of a measure of specific strength, vital capacity, pulse rate before and after exercise.

The tests were given to 65 college women which, when compared with predetermined averages, seemed to indicate that we were dealing with an average group.

Results indicated that the tests dealing with pulse rates which are under the control of the autonomic nervous system are least reliable. The other two tests controlled by the cerebrospinal nervous system show a much higher reliability. The latter compare favorably with certain group intelligence and aptitude tests.

The second part of the study dealing with measures of validity

indicated that no one of these tests was suitable validating criteria. Correlations with point-hour ratio and centile rank also were very low.

*The Effect of Preschool Attendance upon the I.Q.* BETH L. WELLMAN, State University of Iowa.

About 1,500 Kuhlmann and Stanford-Binet examinations were made of children attending the Iowa preschool laboratories. Since the mean I.Q. varied with age, the I.Q.'s were transmuted into percentile values. Gains were made from each test to the succeeding one up to and including the seventh test, four and one-half years after the first test. The gains took place over the winter months when the children were in preschool; over the summer months there was no gain. These gains were not due to practice effects. Greater gains were made (1) over more years of preschool attendance, (2) over longer intervals between tests, (3) with greater numbers of days' attendance.

*The Rôle of Eye Movement Habits in Determining Reading Efficiency.* FRANCIS P. ROBINSON, University of Iowa.

This problem was experimentally evaluated by giving training of such a nature as to increase the efficiency of eye movements and then measuring the effect. Reliable gains were found in reading ability, rate and eye movements. Extraneous factors were shown not to have caused the gains: A matched control group showed no gains and since another matched group given training in comprehension made a different type of improvement, it was concluded that the experimental gains were not due to comprehension training. Likewise motivation, skimming, the validity of photography and experimental adjustments were found to be inadequate explanatory factors. No function besides eye movement habits was improved by such training: Comprehension ability and tachistoscopic perception were not improved and neither visual defects nor incoördinations were treated. That the improvement was habitual was shown by the transfer of gain to other reading tests and by improved scholastic work. These results are to be used later toward a description of eye movement habits.

## SPECIAL REVIEWS

HOLT, EDWIN B. *Animal Drive and the Learning Process: An Essay Toward Radical Empiricism*. Vol. I. New York: Henry Holt and Co., 1931. Pp. vii+307.

This initial volume of an essay toward Radical Empiricism, while implying a philosophy, is not a philosophical discussion.<sup>1</sup> It is a notably brilliant part of a total project to explain conscious phenomena, as the foreword states, "entirely, without reserve or residue, in *physical* terms, and specially of course in terms of physiology." The author believes that William James meant by his radical empiricism exactly that, and to such a program he has thus far adhered without swerving. "In the picture which I have endeavored to present of the living and responding organism, I believe that every statement rests on plain biological foundations, and has a meaning in terms of centimeters, grammes, and seconds; and that I have nowhere surreptitiously introduced any 'psychic' principle, to be conveniently discovered, later on, and used as a *deux ex machina* in explaining mental phenomena." (P. 256.) Behaviorism avoids, to be sure, this last pitfall, but "at a singularly high price! For so far as I understand Behaviorism, it flatly denies the existence of all psychological problems; whereas the animal movements present a great number of psychological problems." (P. 7.) For "another phenomenon has been emerging by virtue of the learning process, and this is awareness, consciousness, or mind." (P. 166.)

This review cannot hope to do justice to the full sweep of the discussion of the subject matter of the volume, nor to the clarity and precision of style, the caution and logical rigor displayed in the evaluation of evidence and in the drawing of conclusions, the objectivity of attitude—save for certain racy comments on the "word magic," "superstitions," and "hypostasizings" that still pepper psychological and, indeed, physiological explanation—nor, finally, to the happy hints of the generative significance, for many problems of every day human conduct, of the principles that develop in the course of the discussion. We shall try merely to sketch the salient features of Dr. Holt's picture of animal drive and the learning process.

<sup>1</sup> See the essay, by H. C. Brown, at the end of the volume, on "This Material World," reprinted from *The Journal of Philosophy*, 1925, Vol. 22, pp. 197-214.

Food taken into the body is the source of the energy that somehow drives the animal organism. Growth, as mere increase in volume, is an anabolic process but, as organic development, it is mainly the work of katabolic processes initiated by *external stimuli*; it involves the release or expenditure of energy as distinguished from its accumulation. This is true from the germ cell onward, and the conditioning environment must be very "constant and correct." Hence such growth is not—as is so widely held—"an unfolding of 'potential' characters" of the fertilized ovum; the content of germ cells is not potential characters, but only living matter with certain chemical specificities played upon by environmental stimuli; structure and function develop from interplay between the two and, from ovum to adult, function modifies structure, and structure alters function—a continuing "functional construction" (Child). Growth, as organic development and not as mere increase in volume, is thus essentially the same as "learning" at later stages of an organism's life. Preformist doctrines of "potential characters" have obscured this fact. It is largely due to C. M. Child and his colleagues, to whom the author gives full credit, that the iron lids of preformist vision have been opened—but not yet wide enough.

Organismic pattern evolves, therefore, as a behavior mechanism, and "the whole course of development is a process of physiological learning" (Child). The pattern of the nervous system certainly develops, as shown largely by the work of Kappers and Bok, in just this way. Kappers' law of Neurobiotaxis bulks large throughout our author's discussion. This law, "briefly stated, is that dendrites grow *towards* an active neurone or nerve bundle (kathode pole), *i.e.*, stimulopetally and contracurrently, provided that the neurone from which the dendrite grows and the neurone towards which it grows are in excitation simultaneously or in close succession." (P. 20.) If we add to this the fact that, in a nervous system sufficiently developed to be termed "synaptic," there is only unidirectional conduction of nerve impulses (from the axone of one neurone to a dendrite of another), "we get, as I believe, the definitive law of association." (P. 23.)

Kappers' law gets its first detailed application in connection with the principle of the conditioned reflex, as developed by Pavlov, Beritoff, and others—a principle that likewise plays a vital rôle in Dr. Holt's essay. It must begin to operate, in essence, very early in ontogenetic development. When neuroblasts have become neurones, and reached a certain stage of development, an impulse entering the central nervous system along an afferent nerve will spread "at

random" (no preformed chains) through this system, from the axone of one neurone through non-nervous tissue to a dendrite of another—and so on—until it comes to some muscle. Let this be the "unconditioned" impulse. Now let another afferent impulse in its spread through the nervous system come somewhere to a synaptic region already activated by the first impulse. Here "the conditions requisite for neurobiotactic growth are realized, and dendrites (on the motor side) of the synapse of junction will be stimulated to growth, contrarily, toward the terminal arborizations of the neurone on which the to-be-conditioned impulses are arriving. This dendrite growth will tend to reduce the extent of non-nervous, and more resistant, tissue across which subsequent nerve impulses arriving on the same 'to-be-conditioned' path must pass in order to reach the motor side (dendrites) of this synaptic region. Thus the resistance will be reduced which this synapse interposes between the 'to-be-conditioned' impulses and the already established motor outlet of the 'unconditioned' impulses." (P. 27.) We have here, then, the basic mechanism of the establishment of conditioned reflexes; and, in the author's opinion, "this growth of dendrites under the stimulus of nerve impulses is the sole basis of learning." (P. 27.) Further, a similar line of reasoning explains the lowering by use of the resistance of any synapse, "or in other words the neurobiotactic growth of dendrites explains the familiar phenomenon of habit" (p. 28). The conditioned reflex, learning, and habit are thus all merely special complications of the law of neurobiotaxis.

As soon as the embryo manifests movement, Pavlov's law begins to operate to determine the behavior patterns of the growing organism. For reasons already indicated, no inherited neural patterns exist; ordered synaptic connections have yet to be made. Impulses from the periphery, denied definite conduction paths, will spread more or less in all directions (J. B. Johnston; Minkowski), guided by the varying synaptic resistances, and always toward the muscles (Parker's discovery, that contractile tissue is differentiated before sensory or nervous tissue, is here of significance). The movements of the foetus are therefore truly *random* movements; investigation increasingly testifies to their uncoordinated character. Minkowski has described them in detail. Even after birth a large part of the infant's movements are of the random order. On this background of impulses spreading at random through the central nervous system toward the motor field, definite neural engrams are, by a narrowing down of the range of motor outlet, gradually established. In this

process we find a further mechanism of great importance—the *reflex-circle* (Bok)—operating, and in accordance with Pavlov's law.

Let contraction of some given muscle be brought about by a nerve impulse that has fortuitously found its way to it—a random movement. This contraction stimulates proprioceptive sensory organs embedded within it (plus those of tendons and joint), giving rise to afferent impulses which reach the central nervous system while the muscle is still contracting—or immediately thereafter. By Pavlov's law these impulses will find outlet in the muscle just contracted, and contract it further—a *non-random* movement. Repetition increases the permeability of the paths concerned, and a reflex-circle has been established. Other sense organs, besides the proprioceptive, may be brought into play—as, for instance, touch and pressure organs if the foetal fingers, in contracting, make contact with the palm of the hand—and thus definite patterns of movement may develop, some of them having adaptive significance.

The relationship of the mechanism of the reflex-circle, as such circles become established, beginning before birth, in all muscles, to the development and maintenance of muscular and postural tonus, is obvious; so, too, the rôle that it must play in the learning process. But any learning due to it is not "trial and error" learning; the reflex-circle reaction directly operates to secure for the organism *more* of the stimulus that elicits it (the child, for instance, repeating a random movement over and over again, when the conditions for the establishment of the circle are present). To characterize responses that give the organism more of the stimulus, the author has adopted the term *adient*. *Abient* responses (avoidance reactions), which give *less* of the exciting stimulus, are—as well as trial and error learning, which they inaugurate—ontogenetically later developments. The early responses of the organism are *adient*, positive, outgoing responses, and they abundantly persist through life. Granted a store of bodily energy, this early and continuing adience of organisms is initiated by external stimuli; no "urge," or "nociceptive" restlessness, is needed.

At this point in the discussion the author applies in suggestive detail the principle of the reflex-circle (depending on the law of neurobiotaxis and Pavlov's law) to the development of movements of progression, and gives also an analysis of the neural mechanism of inhibition as it operates in the progression, *i.e.*, in the reciprocal innervation of antagonistic muscle groups (Chapter VIII); in the next chapter, he takes up the problem of the nature and significance of equilibration and the *activity* of postural tonus. We shall not here

go into these discussions except to say that emphatic emphasis is made of the point that both progression and the maintenance of the (adient) postural tonus activities against gravitational, or other, pulls (equilibration) are purely reflex, automatic, and are mediated at the spinal or, in the case of postural tonus, at most at the mid-brain level. "Voluntary" innervation gives but a "general outline" of required movements of progression, the proprioceptive apparatus reflexly contributing the finer adjustments. In regard to postural tonus, this fact of reflex control "becomes the more impressive when we consider that it is this function of equilibration, more than any other aspect of its behavior, that gives to a young organism the appearance of acting autonomously and 'as a whole.' . . . Such equilibration when combined with automatic movements of progression, . . . yields the substantial foundation for all conduct." (Pp. 70-72.)

The main principles thus far adduced (random movements, Kappers' and Pavlov's laws, Bok's reflex-circle)—which, of course, operate throughout the life of the organism—receive further specific application, namely, to the "education of sensory surfaces" and to the "chain reflex." Both these phenomena are essentially adient, and both vitally instrumental in the narrowing of the range of random activities through the progressive establishment of more, and more highly integrated, specific response patterns. The only intelligible meaning that can be given to the phrase "education of sensory surfaces" (often referred to as 'sensory training,' etc.) is that of *motor* education; the functions of sense-organs develop under the constant guidance of the reacting muscles, the patterns of response of which are, in turn, controlled by the object to which the responses are made. The *object* guides. For details of the argument the reader is referred to Chapter X. Briefly, since an afferent impulse from any sensory spot may spread, in proportion to the number of random paths still available, to any muscle, either directly or through conditioning, a "diverging pencil of motor innervations" develops from that spot. Conversely "every muscle is the apex of a converging pencil of innervations which originate from any whatsoever of the animal's sense-organs (*cf.* Sherrington's final common paths)." Any local adient response of the organism thus exploits, through wide conditionings, reactions of "all the muscles of the body that can in any way assist" just that response of getting *more* of the specific local stimulation. (Such widely deployed spread of an afferent impulse, and converging funnelling off into restricted channels of efferent impulses, make unintelligible any doctrine founded on a coördination

of single "reflex arcs.") Gradually, preferential pathways thus become established, an afferent impulse will cease to spread except to these, and random movements have been reduced to local adiences. But again, "the object guides" in this education of sensory surfaces, this adient "learning"; accuracy of manipulation, for instance, depends on the fineness of the stimulating object. Otherwise, it would be difficult to see how accuracy could ever be attained. "External reference" is fundamental.

In regard to the chain reflex, the other topic to which the principles previously developed may be applied: activities once unrelated become linked in chain sequences because the final action of one reflex path stimulates—or indirectly causes to be stimulated—the starting points of the next, and so on. By conditioning, furthermore, such adient reflex chains may persist or recur through the substitution, for the original stimulus, or other stimuli occurring simultaneously, or in close temporal relationship, with the original stimulus. Auditory stimuli may supplant, in piano playing, the printed notes, and later, tactual and kinaesthetic cues from the playing hands may supplant these. The "conditioned" stimuli which immediately precede the striking of a given chord become most effective, the contributory significance of other such stimuli decreasing, in general, with their temporal remoteness. But such a series of preceding patterns of conditioned stimuli it is that helps to determine the correct sequence of chords. Even wider conditionings enter the picture; one often finds oneself humming a certain musical air because it had been learned under the same associations, or stimuli, that now prompt the humming. But further consideration of these "wider" conditionings may be best postponed to the later discussion of *cross-conditionings*.

In considering chain reflexes, the author discusses (pp. 87-89) the question as to whether a conditioned stimulus, to be effective, must always occur simultaneously with or *before* the unconditioned stimulus; he inclines to the view of Beritoff and of Switzer (and expressed by Pavlov in at least one place) that the to-be-conditioned stimulus may *follow* the unconditioned stimulus, although "at most it may be said that the conditioned reflex is somewhat more difficult to establish, and is perhaps less permanent" under such circumstances. Certainly the either-before-or-after relationship would give greater scope to the organizing of reflex chain patterns. In the survey of chain reflexes the term *canalization* is given to the process by which the resistance of reflex paths is cumulatively lowered by the passage of impulses (probably, through neurobiotaxis, at synapses), such canalization being deeper with the first impulses and probably

in very young tissue, its establishment becoming progressively more difficult with advancing years. "Deep and early canalization is one of the two essential conditions that determine which shall be, in the life of the individual, the *prepotent* reflexes" (p. 92); the other condition is *cross-conditioning*.

And now for "avoidance responses: trial, error, and success." For reasons already given, an organism's first responses and, preponderantly, its later responses, are positive, outgoing, adient. But if "stimulation is, or becomes, very intense, the transmitted excitation 'spreads' (Sherrington, 1906, pp. 150-2) in the central nervous system, overflowing into diverse and random motor channels, and the young organism is thrown into a state of more or less general and incoordinated activity. . . . But some one of these energetic though random movements may carry the organism out of range of the stimulus." (Pp. 94-5.) The stimulus and the organism's movements cease; a process has arisen called trial, error, and success. (Naturally stimuli that produce strong avoidance are usually noxious, but the organism does not at first "know" that they are noxious; it is their intensity that initiates the uncoordinated abient reactions.) The contraction of the last, relief-giving group of muscles is now perpetuated for a longer or shorter time by the following milder impulses from the "injured" region, a time then more indefinitely prolonged by the supervening proprioceptive return impulses (reflex-circle; conditioning) from the muscular contractions that gave relief; the posture of avoidance persists. In these ways does a *definite* abient (avoiding) response become indirectly canalized; not directly (except, probably, to free nerve terminations—"pain spots"), as in the case of adient responses. "Nociceptive" appetitive drives, such as hunger, which are in reality avoidance responses, will be considered later.

The author discusses several suggestive implications of this view of abient, trial-and-error responses; the supporting argument must here, perforce, be omitted. First, avoidance responses soon come to look very positive and teleological since, after all, canalized definiteness eventually accrues to them; but the process is a purely mechanical process—masked by the adaptive relevance that is achieved, a masking that often secures for them the mistaken attribution of "hereditary" character. Second, "as the child's adient coordinations and the reciprocating mechanism of motor half-centers are gradually perfected, the picture of avoiding reactions undergoes an Evolution." (P. 101.) Random movements decrease in number, there arises prompter and more precisely adaptive avoidance of over-

stimulation—*e.g.*, a nicely coördinated reversal of the hand's adient motion towards a "harmful" stimulus—a direct pulling back. This is due to the more complete development of the motor half-centers, occurring in the ordinary course of adient learning, so that the "*first path of overflow* is into those antagonist muscles which will reverse the motion of adience" (p. 102). This is hardly "learned" avoidance, but an indirect consequence of an earlier operating adient reflex-circle. Indeed, the adaptive precision of avoidance will *in general* depend on the precision of the previously acquired adient responses; otherwise, incoördinated responses. "I believe that in practically all learning by trial-and-error, the 'trials' are supplied by adient reflexes." (P. 105, footnote.)

Exploratory freedom of action is therefore important for a child; it enables him, through an acquired adient repertoire of responses, to develop with diminished "error" an "adequate and competent 'faculty' of abience and self-preservation." (P. 105.) Adience and abience are two synthetic results of neuro-muscular mechanism (*e.g.*, random paths, neurobiotaxis, conditioning, reflex-circle, reciprocal innervation), and are of great significance for the developing integration of the organism's behavior. A final point may be added. Many "psychic traumata" arise from the fact that *mild* stimuli, becoming conditioned to violent responses originally excited by over-strong stimuli, will of themselves later excite prepotent avoidance—the antithesis of a healthy development.

In order to continue with the main theme of trial-and-error learning, the genesis of which, as we have seen, lies in abient responses, the highly stimulating discussion of *echo and imitation* (Chapter XIII), with their implications for the development of empathy, sympathy, rapport, leadership, etc., and for child education, is here, reluctantly, omitted. The main theme brings us to *instinctive and appetitive drives*, and to *response to mild annoyers: abience with adience*. "Instincts," as one would surmise from the previous discussion, are to the author, merely a convenient designation "for the rather simpler habits, mostly learned early and therefore well canalized as engrams, of living organisms. Where the activity is consecutive enough to be called instinctive conduct, chain reflexes are generally involved." (P. 93.) But they are—either adiently or abiently, or by a combination of both—*learned*. Their stimuli are *external*; the stimuli for appetitive drives are *internal*.

The reactions eventuating from such appetitive drives (*e.g.*, hunger) are in reality, in their genesis and development, *avoidance* responses; but, unlike external stimuli, the appetitive stimuli persist,

as negative guides to action, until responses ensue that allay the appetite, *i.e.*, that enable the animal successfully to "avoid" the stimuli—but "not along ordinary lines of avoidance." The learning involved in establishing well canalized response patterns that later *promptly* produce such successful avoidance (satisfaction of the appetite) is also by trial-and-error. When fully canalized these successful responses, as in the case of developed abient responses to external stimuli, simulate positive, adient "seekings"; but the neuromuscular (mechanical) processes concerned are basically the same. But because the stimuli are internal, and because of their persistence until "success" is attained, the general behavior picture, in appetitive cases, is different from those involving strong external stimuli; impulses usually start at mild intensity, in autonomic channels but, the appetite persisting, they grow stronger and spread into the general bodily musculature. This produces characteristic restlessness, persisting until appeasement ends it.

There are also persistent but mild *external* annoyers (*e.g.*, atmospheric warmth and cold) that develop a picture somewhat different from that of the internal appetitive annoyers. Adaptation to them frequently occurs, as it cannot occur to the cumulatively insistent major appetitions or to overstrong external stimulation; and in such case "their afferent energy becomes diffusely canalized into the general life activities of the creatures. . . . And thus abience from the mild annoyer and adience to some other stimulus will become one act" (p. 137); frosty air hastens one's steps towards one's goal. Mild annoyers, in short, are selectively and specifically avoided only when they become obstacles—frosty air stiffening the hands in manual activities. Since the chapter on mild annoyers (Chapter XV) presents no new essential principles of organic integration, further comment may be dispensed with. The reviewer would commend, however, the author's discussion demonstrating the happy fusion of abient and adient responses in adaptive acts and, in particular, how these two forms of response unite in adaptive relevance in cases often misinterpreted as involving "fear" (pp. 138 ff.).

Trial-and-error learning has its genesis in avoidance responses to overstrong stimuli; it is seen in the responses to appetitive stimuli; a further development of it occurs when *obstacles* (not necessarily strongly stimulating, arousing direct avoidance) interpose themselves in the course of an organism's adient or abient behavior. A cat in a puzzle-box is a typical instance. Trial and error ensue. The cat is adiently set toward food; it is also hungry (appetitive drive; both

the sensing of the food and the hunger mutually accentuate the adience toward the food. How is anything learned? The author appeals to an observation of Washburn: "Experiments indicate that in maze learning it is the movements nearest the 'success' that are earliest learned" (p. 157). If, therefore, a number of concatenated movements must be performed in a certain correct sequence in order to ensure release, this chain of reflexes will be "learned" backward. In the puzzle-box case the "movement nearest success" is that which opens the door, and the physiological factor responsible for the learning is the sudden release from inhibition of the previous postures and reflexes involved in food adience—a release occurring when the animal sees the food without seeing also intervening impediments. *How* does this learning occur? By a conditioning to the last used, open motor paths (*i.e.*, those of the successful movement) of the proprioceptive impulses from the muscles just released from inhibition. These conditioned impulses "will now (to the extent of the learning) directly innervate the movement that brought success" and "since the food-adience motions and postures are innervated by the sight and odour of food and by the deficit stimuli of hunger, these too will innervate, although indirectly, the movement that raises the latch" (p. 160). Correspondingly the food-adience largely becomes, in further trials, a latch-adience.

In other obstacle-situations, where a *sequence* of steps must be learned in a given order, the same principles hold, to produce learning in a backward order. The author is fully aware of the fact that other mechanisms may contribute to the learning (*e.g.*, annoyers, stimulating direct avoidance, and making for the positive elimination of "wrong" movements); he also realizes that his explanation involves, in part, that the to-be-conditioned stimuli *follow* the motor outflow producing the "successful" movement but, as we have seen, he believes that there is good reason, both experimental and logical, to assume that conditioning occurs under such circumstances. He believes, too, that Washburn's view is "all too overwhelmingly confirmed" in connection with the question of motor block, for we learn only in proximity to goals. But of this later.

We have considered the development of certain forms of adaptive responses to environment. It remains to deal with their *integration*. The essential feature of the first step in such integration is *external reference*; the various forms of response that we have met all developed through reference of the movements concerned to that factor outside the organism which stimulated the movements. The

second step has to do with the immediate functional interrelations of the learned responses. To this question chapters XVIII and IX are devoted. Several of the problems raised are still unsettled, still controversial. We can at most indicate their nature, and the author's general conclusions. Of two outstanding mechanisms contributing to integration, reinforcement and inhibition of responses simultaneously stimulated to action, the former presents no great difficulties; the latter is full of them. The author inclines strongly to the view that inhibition has developed purely as a process of "functional construction," that it does not, therefore, involve "some peculiar principle of inhibition (inhibitory nerves, inhibitory type of nerve impulse, inhibition potency, or inhibition substance at synapses)," and that it is due to overcrowding, or interference, of impulses at "motor half-centers"—themselves purely functional, and not distinct anatomical, units. A motor half-center is a synaptic region where proprioceptive impulses from both a given muscle and from its antagonist *converge* on a motor neurone to the former muscle. A *pair* of such half-centers explains reciprocal innervation ("algebraic summation") of antagonistic muscles, if one takes account of the fact that impulses are extinguished by overcrowding; specifically, that the reciprocation between paired half-centers is due to relative degrees of overcrowding.

The rôle of reënforcement and inhibition in the general integration of the organism is fundamentally based on the antagonism of muscles. In comment on the general situation, the author states that he has presented the view that reciprocal innervation is due to overcrowding because at present it is the only view that has considerable empirical support; but that he does not think that it is infallibly established; adding, however, that "the theories of inhibition by nerves, impulses, or substances" (*e.g.*, Sherrington's E and I substances) "that are 'specifically inhibitory' seem to me purely verbal" (p. 212). He favors, too, the concept that in conduction impulses acquire at synaptic regions of decrement a "charge," a "mounting potential," which stimulates "the next dendrites at a frequency that varies as the synaptic potential varies, but at a pulsation intensity that (owing to partial overcrowding) varies *inversely* as the frequency (or the potential)," (p. 197). For the details of argument in regard to the problems presented by this second step in integration—the mechanisms of the interrelations of learned responses—the text must be consulted.

There follows next a stimulatingly suggestive discussion of fur-

ther classes of phenomena that make for integration—*sustained responses*, *cross-conditioning* and *motor block*. A third step in integration is, then, based on the fact that (reflex-circle) “every adience tends to maintain itself” (p. 215). Such a sustained adience (and, of course, coöperating sustained abiences), determined by the object serving as a “guiding” obstacle, defines a residual *locus of freedom* (and, at the same time, a limitation of freedom) within which locus random movement may still play. A child, with sustained adience to a toy has, if his manipulations are confined to one feature of it, still full freedom randomly to explore the rest of it. But every additional response, during the maintained adience, by just so much narrows the locus of freedom, while his total “chain” of manipulations becomes correspondingly more definite and precise. He attains integrated and canalized adaptation to the object.

As a fourth factor in integration, and different in mechanism, is dynamogenic or *cross-conditioning*. It has to do not only with selection, but also with fixation of responses into *preferred* patterns of conduct, enduring predilections. This cross-conditioning arises from wide ranges of stimuli occurring at the same time that some specific response is progressing towards “canalization,” and performs the major rôle in fixating it; for “a neurogram howsoever deeply canalized will not induce a posture or other response unless it is fed by impulses from some source of stimulation” (p. 223). These may be irrelevant and very ubiquitous. The motor reinforcement from such cross-conditioning is termed dynamogeny. Much of its significance lies in the fact that these stimuli may not present themselves in consciousness at all; hence the appearance of spontaneity in actions (so often attributed to “inherited tendencies”), the “irrationality” of preferences (reviewer’s term), and much of what is involved in the phrase “a character and will of his own.” The stimuli will not enter consciousness unless they arouse a *response specific to themselves*. Instances of fixations induced by cross-conditioning are in number legion—the studious posture, the recurrent humming of a tune when stimuli accessory to its original learning again impinge, the sudden falling into an irrelevant mood (as when sunshine and breeze induce the yachting “complex” although the yachtsman be far from the sea), many of James’s “habits”—the fixed professional “set” of the young lawyer or doctor, etc., etc.

Of the four factors making for integration—external reference of all learned responses, the mutual summation and inhibition of responses, simultaneously sustained responses with a residual locus of

freedom for random activity, and cross-conditioning—the author suspects that “the second is not an independent integrating factor, but rather an aspect of the mechanism in which and through which the other three integrating factors operate” (230). A similar comment might be made regarding a fifth phenomenon, *motor block*.

“Considered merely as behavior, and all problems of the mind apart, the adult life of any creature exhibits almost continuously a restless dubeity, cogitation, and scheming; and this is too multifarious and intricate to be subsumed under the rather simple principles of adient and avoidant learning which we have studied. That it should *all* be in the last analysis self-interested, follows inevitably from the physiological structure of every organism.” (Pp. 239–40.) (The reviewer here omits the author’s general discussion of “enlightened self-interest,” as well as certain other features of the chapter [XXI] on Motor Block.) Such a picture results from motor conflict among the forms of response that have already been considered—*motor block*. The inner dynamics of motor conflict are at present uncertain but, when it occurs, a longer or shorter arrest of the individual’s activities takes place. Thence ensues a learning of how to resolve these conflicts (“obstacles”) or “surmount the difficulties.” If trials and errors fail to bring success, “functional” mental disorders often supervene. When conflict between antagonistic motor tendencies is thus blocked, nervous energy overflows into random motor channels; heightened innervation is marked. The consequent trial-and-error learning involved exploits—in contrast to earlier trial and error—mostly responses (the “trials”), possessing severally a specific adaptive character, that have already been learned; a trying out of the organism’s adaptive repertoire. This trial-and-error learning initiated by motor block is probably “the last and ‘highest’ type of learning” (p. 248). And the principle, that higher learning is a trial-and-error surmounting of such “obstacles,” has considerable practical importance (*e.g.*, children, and others, if they are to develop significant interests and attain worth-while results, must be encouraged and left free to surmount the obstacles that hinder them). The phenomenon of motor block lends further support to Washburn’s view (already quoted) that it is the movements nearest the “success” that are earliest learned; “man learns only in proximity to goals, and not far in advance of his immediate apprehension of that which he desires” (p. 238).

In his final chapter (*the organism as a whole*) the author, *inter alia*, pays his respects to the apparent belief, frequently expressed,

that in some way the "whole" constitutes, generates, dominates, etc., etc., its parts." But "a whole is *not* more than the sum or totality of its parts *in* that arrangement or organization which *constitutes* the whole." (P. 259.) To say that a "whole" regulates its parts is to make of the whole some "reified" or "thing-ized" metaphysical "other." And, in fact, "the organism *never does* act as a whole. The many stimuli that environ us play on us the most varied tunes, very much as fingers play tunes on a piano" (p. 261).

We may conclude this summary of the first installment of Dr. Holt's essay with a quotation that in part forecasts what is to come. "We are now ready to go on, in our second volume, to a study of the mental life of the organism, and to follow out that broad hint which was dropped so long ago by La Mettrie, that 'the brain has its muscles for thinking, as the legs have muscles for walking.'" (P. 256.) And: "From the point where we now stand it is but one short step to a definition of awareness and consciousness in terms of physiological process; and it is a step which I have previously briefly outlined" (in *The Freudian Wish*, 1915, Henry Holt and Co.). Mind is, in short, an emergent, a new phenomenon or transformation level, arising from physiological organization.

The reviewer has attempted to give an account of the substance of this first volume of Dr. Holt's Essay, rather than to talk *about* the issues that are discussed; because, doubtless, that is the type of review that he himself prefers to read. To him, granted the premise of "radical empiricism," the general development of the argument is convincing and illuminating. There are, of course, physiological issues still undecided as, for instance, the mechanism of inhibition and the question as to the frequency and adequacy of "conditionings" when the stimulus to be conditioned *follows* the conditioned stimulus. Much of the discussion is also (perforce) frankly deductive, but in this it differs in no way from any of the major efforts toward systematic explanation—and it adheres much more rigidly than many to experimental investigation and rigorous logic. It is refreshing to find a systematizer so fully equipped in philosophy, psychology, and physiology. Nor does the present uncertainty in regard to some of the physiological evidence vitiate the cogency of the demonstrations of the general significance of the *underlying mechanisms* adduced as the foundations on which the integrated behavior of organisms is built; particularly the random spread of nervous impulses, neuro-biotaxis, conditioning, and reflex-circle, together with their consequences, adient and abient behavior. Definitive opinion of the value

of the entire essay must in part be held in abeyance until the further installments are issued. The reviewer ventures to predict, however, as he has already indicated in regard to this first volume, that the completed work will profoundly influence systematic thought in psychology. He particularly commends this volume to the teachers of psychology that have to deal largely with general introductory text-books.

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*Roswell P. Angier*

STUTSMAN, RACHEL. *Mental Measurement of Preschool Children with a Guide for the Administration of the Merrill-Palmer Scale of Mental Tests*. World Book Company, 1931, pp. x+368.

The author of this volume has provided a much needed tool for the mental measurement of children from two to five years of age. As she observes, the available scales for this age level need supplementation chiefly because they have been standardized on too few cases, because they deal with a limited range of material, and in certain cases, where adequate in other respects, they do not make possible a statement of results in quantitative terms. In the present standardization these defects have been remedied to a great extent and the scale has been excellently adapted to the practical demands of work with young children who require material sufficiently interesting in content to hold their attention.

The scale was organized around thirty-seven original items, twenty of which were "variable score tests." These, when introduced with different time or accuracy standards at different ages, bring the total number of test items in the completed scale to ninety-three. The material is varied in character, though the non-language aspects of behavior are slightly overemphasized and only twelve items, classifiable as language tests, are included. A "Guide for Personality Observation" is furnished which is designed to supplement and aid in the interpretation of the data obtained from the intelligence tests.

Standardization was carried out on a group of 631 children selected from a variety of sources. From fifty-seven to eighty children were used at each six months' age level from eighteen to seventy-seven months of age. The chronological ages of the children at any one level were distributed throughout the six months' range. The facts are not given but the distributions of age were presumably much the same at each level, for otherwise serious errors would have been introduced into the norms by the fact that a high correlation of score with chronological age exists within each group so that

a preponderance of cases at the upper or lower end of a group would alter the average score of that level markedly.

The items are arranged in order of difficulty to form a point scale in which each item passed receives a score of one point. These raw scores may be interpreted in several ways: (1) The average scores for each age level have been plotted against chronological age so that a raw score may be converted into a mental age rating. (2) Tables have been prepared showing the standard deviation values of the various raw scores at each age level, including interpolations of values for the intervening months. The author states that, "when the standard deviation value of the child's score is determined, it may be compared with those of other children irrespective of age difference." This manner of comparing performance of children at different ages has certain clear advantages over the I.Q. with its assumption of zero as the point of origin. The comparability of the values from age to age would seem to hold, however, only if the proportion of cases which falls within each standard deviation value at each age level remains about the same from level to level. Though this point is not mentioned, examination of the percentile tables indicates that the middle 50 per cent of the cases falls roughly within the same standard deviation range at each age level for the present standardization. (3) A table of standard deviations in terms of intelligence quotients is also given. This reveals a wide variation in I.Q.'s at different age levels for the standard deviation values from 0.5 to 2.5. The author points out that this renders impossible the use of an I.Q. rating with the Merrill-Palmer scale. (4) A table of percentiles is also available for interpreting the raw scores.

A unique feature of the scale is the treatment of omitted and refused tests. All items refused or omitted below the level of the child's attainment on the whole scale are counted as successes, and those above this level as failures. The importance of this problem in tests for young children is apparent, but the adequacy of the present solution must be determined by an empirical check on the reliability of scores obtained in this fashion from tests repeated on the same individuals. Such a check is highly desirable.

The validity of the scale has been determined (1) by its ability to differentiate children who "as judged by the general impression of the Merrill-Palmer nursery school staff, showed differences in mental ability." Apparently no effort was made to record these judgments systematically and to check up on their reliability and consequently no correlation with this criterion is given; (2) the total scores show a correlation of  $r=0.92$  with chronological age; (3) overlapping of

the distribution of total scores between various age groups is relatively small; (4) the scale when tried on twenty-nine feeble-minded children seemed to differentiate them from normal children; (5) the Merrill-Palmer scale gives high correlations with the Stanford-Binet scale.

The scale does not appear to have been tested as yet for its reliability in measuring the performance of the same individuals at different times. This is obviously necessary before a final evaluation of it is possible.

HELEN PEAK.

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HILDRETH, GERTRUDE H. *Psychological Service for School Problems*. Yonkers-on-Hudson: World Book Company, 1930.

Dr. Hildreth's book is a veritable encyclopedia of useful information pertaining to the various aspects of psychological service in schools. It is directed to three groups of readers: school administrators; psychologists in service and in training; and the school patron or general reader. (Although not specifically mentioned, the class-room teacher should also be included here.) Because in training and experience the three groups are necessarily diverse, not all parts of the book will be equally interesting to all readers, but there is much to be found which is of particular interest to each group.

The school administrator will find arguments in favor of the kind of guidance program which can be organized under the direction of a psychologist, as well as a consideration of administrative details such as laboratory equipment, office procedure and types of records useful in child accounting.

Content which appeals directly to the administrator will also interest the psychologist, whether practising or in training. Both groups of psychologists will also appreciate discussions of clinical procedures, problems for research, and frequent references to investigations made in the field. These investigations, summarized in the context and listed in the back of the book, deal with problems such as the organization of service bureaus, uses of tests, diagnostic and remedial procedures, pupil classification and statistical research. There is also appended to the book a classified list of selected tests and scales.

To the student who is preparing to become a child specialist or a school psychologist the text is particularly valuable as a rich source of factual content, non-controversial in nature. Moreover, the book is written in a terse, outline style which should facilitate the sum-

marizing of important topics and the selection of problems for further investigation and discussion.

The studies presented in the book are carefully compiled and skillfully organized, with a minimum of personal opinion. The book should prove to be widely useful.

BESS V. CUNNINGHAM.

*Teachers College, Columbia University.*

## NOTES AND NEWS

PROFESSOR KURT KOFFKA has completed his appointment as William Allan Neilson Research Professor and now becomes a Professor in the Department of Psychology at Smith College. Professor David Camp Rogers and Associate Professor Marthe Sturm of this department will be away on leave next year, and Professor W. S. Taylor will be on sabbatical leave the second semester.

APPOINTMENT of Dr. S. J. Beck as Research Assistant in Psychology, Department of Psychiatry, Harvard Medical School, for the year 1932-33, is announced. Dr. Beck has resigned as Senior Resident Psychologist at the Boston Psychopathic Hospital, where he has been since 1929.

ON THE 29th of October, 1932, there will be held in Leipzig a celebration of the hundredth anniversary of the birth of Wilhelm Wundt. Wundt was born on the 16th of August, 1832.

ROBERT S. SACKETT, PH.D., Yale 1932, has been appointed Instructor in Psychology in the New Jersey College for Women, New Brunswick, New Jersey, and Robert R. Sears, Ph.D., Yale 1932, has been appointed Instructor in Psychology in the University of Illinois.

DUKE UNIVERSITY, Durham, N. C., announces a new psychological quarterly to be known as *Character and Personality*. Publication will begin in September, 1932, and continue thereafter in the months of December, March, June, and September. A British edition will also be issued simultaneously in London, and a German edition in Berlin. Annual subscription price is \$2.00. The editor will be Robert Saudek (London) and among members of the editorial board, William McDougall, Alfred Adler, Pierre Janet, C. G. Jung, Johannes Lange.

THE following items are taken from *Science*:

A portrait of Dr. J. McKeen Cattell has been presented to him by colleagues and former students. The painting is by Leopold Seyffert, N.A. The committee in charge consisted of Professor A. T. Poffenberger, of Columbia University; Professor S. I. Franz, of the University of California at Los Angeles; and Dr. F. P. Keppel, of the Carnegie Corporation.

Dr. Ivan Pavlov, Professor of Physiology at Leningrad, who celebrates his eighty-third birthday on September 14, presented papers at the International Congress of Psychology recently held at Copenhagen and at the International Congress of Physiology recently held at Rome.

The title of Professor Emeritus has been conferred on Dr. Robert MacDougall on his retirement from the chair of analytical psychology at New York University, which he has held for thirty-one years.

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